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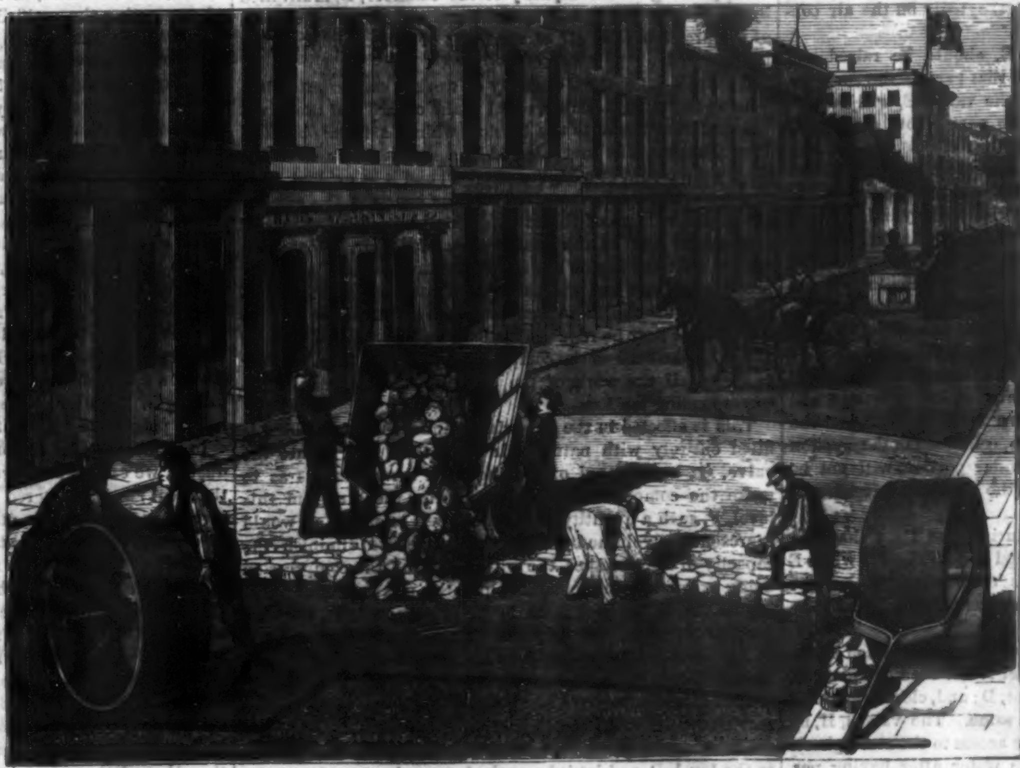
Improved Wood Pavement.

The subject of street paving still continues to attract the attention of inventors, who cannot fail to perceive the extent of the field open to successful competition, and the rewards possible to any improvement in quality without increase of cost, or to decrease of cost without deterioration in quality. A still richer reward awaits the inventor who shall give to the public a better pavement than has yet been discovered at cheaper rates than those in use.

We do not understand that the inventor claims the pavement under consideration to be better than any yet discovered, but he does claim that it is better than any that can be laid at the same cost, while it is superior to many that cost much more. Having had no opportunity to inspect the pavement under wear, we must leave it to our readers to judge from the nature of the pavement, as derived from the accompanying engraving and description, how far these claims are justified in practice, simply giving it as our opinion that it possesses all the elements of durability to be expected of a roadway composed of the materials employed.

In putting down this pavement, the street is first graded in any of the well known methods, and the earth made compact by tamping or rolling. Upon this road bed is laid a concrete foundation, composed of broken stone, sand, or gravel, thoroughly mixed and bound together with concrete composition, the cementing material of which is chiefly Trinidad asphaltum. Upon this foundation are placed, on end, cylindrical blocks of natural wood (the bark removed), cut from young trees or saplings of small diameters (say from three to nine inches). Cedar, chestnut, and cypress trees of commonly small growth can be utilized in this pavement with, it is claimed, less liability of decay than pine, hemlock, spruce, or other woods, mostly used in other wood pavements. The irregularities of the natural wood prevent vertical displacement, and make the pavement stronger than when sawn blocks with parallel sides are used. The spaces between the blocks are filled with dry gravel or broken stone, and filled flush to the top with the hot melted asphaltic composition, which cements the blocks together and firmly to the foundation, making the roadway one solid mass impervious to water. The top of the pavement is then covered with the asphalt composition in which, when warm, is rolled coarse sand or grit, so that the water will be kept out, and the wood protected from wear. It is claimed that in this way a very high degree of durability is secured.

It is further claimed that the practically indestructible foundation, giving additional firmness to the roadway, entirely prevents frost under the pavement, and that the blocks and concrete filling are cemented to the foundation with a bond so perfect that the pressure is divided over large areas, preventing portions from sinking under heavy travel, and the surface from becoming uneven and "wavy" as seen in some other pavements.



THE FLANIGAN WOOD PAVEMENT.

It is stated that actual experiments show that a moderate amount of excavation will not disturb the pavement. It seems obvious that pavement made from wood of about the same size and growth will wear much more evenly than that made from trees of various sizes. As small wood, that will be of no great value for lumber, can be utilized, the most durable, like cypress, cedar, and chestnut, can be used at a less expense than the more perishable pine, spruce, or hemlock lumber used in other wood pavements. If the last named woods are used, they can be treated by the most approved process, namely, creosoting, and still, it is claimed, can be laid at a less expense than any other good wood pavement.

Two great advantages in this pavement are its simplicity in laying and equal facility in taking up and relaying where sewer or gas connections are needed. The explanation is, that the concrete can be replaced so as to firmly reunite with the part undisturbed, enabling the blocks to be replaced upon the same uniform surface, cemented as before, making the bond complete, and obviating the unevenness made in the repairs of some other pavements.

We are told there were about 40,000 yards of this pavement laid in Detroit last season, and that it is considered a success in that city.

This proves, more than any thing else that can be said, in favor of the pavement, as it is only actual use that will convince the public of the value of any new improvement of the kind. We trust a trial of this pavement may be made in this vicinity, that we may form an intelligent opinion of its merits from actual observation and comparison with the many different pavements to be found in New York, Brooklyn, and neighboring cities.

The invention was patented, in May, 1871, by Flanigan & Winser, of Detroit, Mich., who may be addressed by those desiring further information.

THE AIR COMPRESSORS AT THE MONT CENIS TUNNEL.

The motive power used for the perforating machinery in the Mont Cenis tunnel was air, the compression of which took place at some distance from the mouth, the compressing agent being water. The compressors may therefore be termed water column air compressors. The accompanying

THE MONT CENIS TUNNEL AIR COMPRESSOR.

engraving represents a complete vertical section of one of these compressors. For want of space, the reservoir of water from which the compressing column, A, descends, has been omitted. The vertical hight of the fall, through the inclined tube mentioned above, is a constant, the level in the reservoir being permanent.

A is the compressing column, B, the chamber of compression, C, the tubes for conducting the compressed air to D, the recipient for the same, E are feeding valves, and F, discharging valves, G, the compressed air valve, H, the inlet air valves, H' are acceleration valves, L, the motive lever of the feeding valve, L', the motive lever of the discharging valve, M, the recipient of discharge having a canal of escapement, P, the regulating plane.

The supply valve, E, moves vertically. On the spot where it is placed, the compressing column takes an annular form, and the compressing agent, instead of moving along the axis of the column, and remaining cylindrical, is transformed into an annular vein, which runs along the outer side of the valve, E, and becomes cylindrical again below this valve. The section of the annular vein was calculated to be equal to the section of the cylindrical column of compression, so as to leave the section of the compressing column constant throughout its hight.

In the diagram the valve, E, is supposed to be open, and the compressing column acts uninterruptedly on the air contained in the chamber, B.

Now suppose that the valve, E, should be raised, and should close the annular space; all that part of the compressing column which is placed above the valve, E, will be suspended, and will cease to act on the part below, during the whole of the time that the valve, E, closes the annular space and cuts off the column above; and hence the object of the valve, E, is to admit and to suspend the action of the compressing column. The valve, F, is also cylindrical, and moves vertically, opening, as it rises, the lateral orifices of the recipient of discharge, and closing them in its descent. Raising the valve, F, all that part of the compressing column which is inferior to E is put, as well as the chamber, B, in communication with the atmosphere; and hence the water in M and in B will take naturally the level, P, determined by the level of the water in the canal of escapement and in the recipient, M. All the part, B (chamber of compression), will then be full of atmospheric air down to the level, P, and the portions of the compressing column, contained in the syphon under the valve, E, and in the annular portion, will not be submitted to any pressure except the ordinary pressure of the atmosphere.

The valve, E, remains closed during the time that the valve, F, makes its double stroke and *vice versâ*. If, while E is open, F were also opened, it is evident that the water would escape with great impetus through the lateral orifice, M.

The valve, G, placed at the top of the compression chamber, B, by rising allows the air, after it has been compressed, to escape from B into the recipient, D; and, closing again, it prevents the flowing back of the same. The valves, H, by opening from outside inwards, give access to the atmospheric air into the chamber, B, when the water, after having performed the compression, escapes through F.

The use of the valves, H', will be explained hereafter; for the present we assume that they are closed. It is easy to understand the action of the compressor. Suppose the valves E and F both closed, and the level of the water to be at P in the chamber B; let this chamber, B, be full of atmospheric air, and let the valves, H, be supposed shut.

Now, allow the valve, E, to fall; the compressing column, A, will immediately enter into motion; it will rise in B, and will compress the air contained in this chamber; the air in B will be compressed until it has acquired a sufficient degree of force to lift up G, and then the same compressed air will enter the recipient, D, the water rising until it touches G, where it will have lost all its velocity; the valve, G, will then be pressed from below only, by the static pressure of the compressing column, whereas, from above, it sustains the pressure of the air which has been driven into D, equivalent in this case to double the static pressure of the column, A.

At this moment, all the compressing column up to the valve, G, is at rest. Let us then shut off, by lifting E, all that portion of the compressing column which is above E. and intercept its action on the portion below; let us open the valve, F, and the water contained in B is driven out into M, and will flow into the canal, N; the valve, H, will open under the pressure of the atmosphere (vacuum having been formed in B), and the atmospheric air will enter into B, and will drive down the water to P. When this level shall be reached, the whole system will be at rest, and ready to commence a second "pulsation," and to that effect let F be closed and E be opened, and the same evolution which has been described will be repeated.

The play of the valves, F and E, is regulated by the engine, W, which governs L, on which specially formed eccentrics are fixed, which produce the vertical movement of the valve at the necessary moment.

The result obtained with one pulsation is, as we have seen, the compression and the imprisonment in D of all the air at atmospheric pressure contained in B from the level, P, up to the valve, G. This result has been obtained through the action of a column of water of fixed hight and determined section and form, which, starting from the state of rest, flows with variable velocity through a definite space, at the limit of which the column of water loses all its velocity and passes again into the state of rest, after having given over, to the volume of the air it has compressed, all the dynamic effort which has been consumed between the initial and final instant of the pulsation.

Up to the present, it has been supposed that the compressing column, starting from the level, P, in order to rise in the chamber, B, commences immediately to compress the air therein contained; and this hypothesis gives the normal state of the work of the machine; and from it those conditions are derived to which the compressor must answer to develop to the greatest possible industrial effect.

If a compressor were established, with a chamber, B, of a hight corresponding to a compressing column likewise determined, the air would not be compressed to a higher state of tension than the one which would correspond to these data, and this circumstance would be inconvenient; however, the limits of the action of the compressor can greatly be extended, and to such a degree that the amount of compression should not depend on the hight of the compressing column.

Referring to the diagram, we observe that from the level, P, up to the valve, G, the chamber of compression presents a constant capacity. The compressing column, A, will always start from the level, P, and will again return to a state of rest, after having reached G. The effect, produced by the column between the beginning and the end of the motion, is a fixed quantity of mechanical work, the maximum limit of which is represented by the product of the volume of water corresponding to the capacity of the chamber, B, multiplied by the density of the water; and for the hight of the column of compression, the half of the hight of the chamber, B, being deduced.

Now this determined quantity of work is concentrated in a volume of atmospheric air, equal to the capacity of the chamber, and compressed to the tension which is to be obtained. It can, however, be concentrated in a smaller volume if the air is compressed at a higher tension; and it is evident that, as the work to be concentrated remains constant, the smaller the initial volume of the atmospheric air to be compressed, the greater will be the final tension of the air. Whence it results that the hights remaining constant, both of the compressing column and the chamber of compression, it will be possible, with the same compressor, to obtain air at as high a tension as may be required, so long as only such a volume of air is admitted to the compression chamber, that, in order to absorb all the work of the column, P shall assume the corresponding tension.

This is effected in the following manner: The chamber is filled entirely with natural air from the level, P, into the valve, G; but, instead of making such arrangements as to make the compressing column compress the air from this level, P, such a quantity of air is allowed to escape as would represent the volume by which it is wished to diminish the capacity of the chamber, the whole effect of the compression being exerted on the remaining quantity of air. Small hanging valves at H', kept open by their own weight, are used for this purpose; but they can be closed entirely, and the compressor can be reduced to its normal state by closing them all, or any number of them can be closed and the remaining ones left open; hence the capacity of the chamber may be regulated according to requirements.

Let us now suppose that the compressing column has sunk to the level, P, and let it be ready for a pulsation; if all the clapets at H' were closed, the pulsation would be normal, and it would take place as already described; but if these small valves are open, the air raised by the compressing column will not be compressed, but will escape partially through the clapets; when the ascending column shall have reached these clapets, in consequence of its greater density, it will close them successively; and when the last has been closed, the ascending column will begin to compress the air above it, which is reduced in volume to an extent depending upon the position of the top clapet to the valve, G. The motion of the compressing column will be entirely arrested, as in the normal pulsation, and a much smaller volume of compressed air will be obtained, but it will be compressed to a far higher tension.

Movable Wagon Stakes and Bolster.

Jacob W. Smith, of Dixon, Iowa, has recently taken a patent for an invention for movable and adjustable wagon stakes and bolster, constructed as follows: A band of strap iron, varying in thickness and width to suit heavy or light wagons, is passed around the sides of the entire bolster, so that the edges of the straps will be even with the top of the bolster.

The ends of the bolster thus prepared are perforated entirely through strap and wood with holes at given distances, to near the center of the bolster if necessary, to receive the bolts which fasten the movable stakes. The stakes are constructed of the usual wood material, cased by a strap iron passing from the inside bottom of the stake, up, over, and down to the outside bottom of the stake, the iron strap then forming a flange at right angles, two or three inches out, resting on end of top of bolster, with an iron brace extending from the middle of the outside of stake to the end of said flange, and securely riveted to it.

Each stake has a strap of iron fastened to its sides from the middle, downward to the bolster, thence forming two prongs with eight angle shoulders resting on the bolster and extending down its sides half way, with holes in the projecting ends of straps, conformably to the holes in the ends of bolster, through which holes the rods go to fasten the stakes to the bolster. These rods have hand nuts at the ends to keep them from slipping out, and can be slipped out and the stakes carried toward the center or extreme ends of the bolsters to take on a wide or narrow wagon box, or to exactly fit any width of logs of lumber, hay rack or load desired. A boy can slip off a wagon box by taking off the side stakes. This invention seems to be a valuable improvement in the wagon line, and we hope to see it in general use.

ILLUMINATING GAS—NATURAL GAS WELLS—COAL GAS—WATER GAS FALLACIES.

NUMBER I.

From a lengthy paper in the *American Exchange and Review* for January, we make the following copious extracts:

The history of illuminating gas has been often recounted. From the most authentic descriptions of its rise and progress, it is evident that its manufacture was suggested by the experiments made with natural gas issuing from the earth in close proximity to coal seams. In the writings of ancient authors, mention is made of perpetual fires which were burned on altars consecrated to the worship of mythological deities. Strabo and Plutarch refer to these mysterious fires; while Herodotus, Vitruvius, and other early historians allude to the bituminous wells of the island of Zante, whence issued streams of inflammable vapor, which were used to inspire the multitudes of superstitious worshippers with profound reverence for sacerdotal authority. In India and China, these wells have been known from remote antiquity; and it is said that in the latter country the gas thus naturally exuding from the ground has for a long time been conveyed in pipes made of bamboo, and used for boiling salt. Gas wells of this description abound in various parts of the world; one of which, in England, was probably the means of suggesting the artificial production of gas and its utilization as an illuminating agent. In this country, several wells of more than ordinary interest have been discovered, yielding large volumes of gas of considerable illuminating power. Among them may be mentioned those in the town of Fredonia, New York, where two companies furnish light to a village of three thousand inhabitants, produced solely by burning the natural gas as it rises from the ground. At Bloomfield, in Ontario county, N. Y., there is a well, from which, according to the estimates of Professor Henry Wurtz—one of the best authorities on the subject—the daily flow of gas is upwards of 400,000 cubic feet. In Ohio, near the town of Gambier, remarkable wells of a similar character have been described by Professor J. S. Newberry, where the gas has constantly flowed without apparent diminution of volume since 1866, and which, on being ignited from the orifice of a two inch pipe, produces a flame twenty feet or more in length. Similar phenomena have likewise been observed in the petroleum region of Pennsylvania.

In alluding to the history of this important branch of industry, we cannot pass over the observation of Dr. Watson that coal gas is unaltered by being passed through tubes immersed in water; or, in other words, that the condensation of some of its constituents does not impair its illuminating properties. This fact is noticed in the "Chemical Essays" of this gentleman, published in 1767. Other experiments of this nature continued to be performed by various persons, but with little or no practical results. In 1787, Lord Dundonald, a Scottish nobleman, secured a patent for making coal tar—or, more properly speaking, coal oil, for this was the substance he desired to produce. In condensing this product, the gaseous body eliminated by the distillation of coal was collected for amusement and curiosity; and no other purpose than that of the entertainment of his friends seemed to inspire his exertions. These investigations, however, were not without their fruit. A countryman of his lordship, by the name of Murdoch, then living at Redruth, in Cornwall, who had read of the experiments above described, was led to investigate the nature of the products of distillation, and extended his researches to the volatile bodies obtained from peat, coal, wood, and other combustibles. These investigations were pursued with some degree of system, and it was ascertained that, by properly regulating the processes of carbonization and condensation, a uniform product of high illuminating power might be obtained. The practical mind of Murdoch soon appropriated the idea that by constructing receptacles for the gas, and conveying it through pipes, it might be manufactured and utilized on a large scale. He lighted his own house in this manner, conveying the gas in pipes about seventy feet from his miniature gas works, and likewise constructed a portable gas lantern which he carried with him at night, much to the discomfiture of the superstitious peasantry of his neighborhood, who strongly suspected him of witchcraft. In 1798, Murdoch erected gas works at Messrs. Boulton & Watt's Soho foundry, and having entered into the employment of that firm, he personally superintended the operation and gradually perfected the details of the manufacture. That gas illumination, as illustrated by its employment at this factory, was a success cannot be doubted; and yet several years elapsed before it was generally adopted. In 1802, at the illumination in honor of the peace of Amiens, the superiority of the display produced by the Soho foundry was so marked that general attention was attracted to the new method of illumination, and its use gradually extended. A number of large cotton mills were lighted by gas about the year 1805. The Lyceum theatre of London was the first place of amusement which employed it; and in a short time, its advantages having become better appreciated, its use became more general. But notwithstanding the fact that these advantages obtained a wider recognition, some opposition was manifested to its introduction. Grave predictions of danger were uttered, and no little ridicule was cast upon the project. When Napoleon was informed of the subject, he remarked: "*C'est une grande folie.*" Sir Walter Scott was no less incredulous, and said that he feared London would be on fire by it, from Hackney gate to Tyburn; while Lord Brougham declared that "the idea was worthy of the philosopher who proposed to extract sunbeams from cucumbers"—a remark, by the way, which, though uttered in a spirit of irony, in the light of modern scientific opinions contains elements of sober reality. Even

Sir Humphrey Davy considered the idea of utilising gas so ridiculous that he contemptuously asked "if it were intended to take the dome of St. Paul's for a gasometer?"

As soon as gaslight became firmly established in England, its merits claimed recognition on this side of the Atlantic, and in 1816 the first American gas light company was chartered to light the city of Baltimore. Six years later, in 1822, Boston adopted the new method of illumination; while the old New York Gaslight Company, which lights the city from Grand street to the Battery, was chartered in 1823. Brooklyn and Bristol, R. I., were lighted in 1825. In 1830, the Manhattan Gaslight Company of New York, now the largest and wealthiest in America and fourth in size in the world, was chartered. The district of this corporation extends from Grand street to Thirty-fourth, and from river to river. Other cities pronounced in favor of the new light as follows: New Orleans in 1835, Philadelphia and Pittsburgh in 1836, Louisville in 1838, Cincinnati in 1841, Kensington (Philadelphia) in 1844, Albany in 1845. From this date, gas works multiplied with rapidity; and as the superiority of the new light became evident, cities and towns in all parts of the country were soon supplied with it.

The Baltimore gas works were originally constructed to make gas from coal tar, but this plan proved a total failure, as might have been predicted. After this unsuccessful experiment, the works were reconstructed by an English engineer; but, this change not proving satisfactory, they were again remodelled, and gas was made from bituminous coal. In Boston, a mixture of coal and rosin was used; while, by the two New York companies, rosin alone was employed. All of these works were deemed more or less defective, and when, in January, 1833, the question of erecting gas works in Philadelphia was brought before the councils, a committee was appointed to consider the question and to make a report. In January, 1834, it was resolved to send an engineer to Europe for the purpose of investigating the best gas works there in operation, and to obtain such information as might be useful in erecting works in the city. The late Samuel V. Merrick was selected for this mission; and, in furtherance of his instructions, he sailed in March, returning in December of the same year. Notwithstanding a violent opposition to the project, gas works were erected by Mr. Merrick; and, on the 10th of February, 1836, Philadelphia was lighted with gas.

All substances of an organic nature, when exposed to a high temperature in close vessels, undergo a remarkable transformation. If the experiment be performed in a retort, and that portion which is volatilized by the heat be cooled and collected, it will be found that the original substance has been split up into three distinct bodies, viz., the solid coke which remains in the retort, tarry matters (including water) which condense to a liquid, and permanent gas. A still further examination of these products would disclose the fact that although they present a homogeneous appearance, they are really mere mixtures of various bodies, which are capable of minute subdivision; and that the liquid tarry matter contains substances which, when isolated, assume a solid form. Complex as these bodies are, they are essentially composed of but two of the elements, carbon and hydrogen; although they include notable quantities of other elements, which however are regarded as impurities, and which, in the details of gas making, are eliminated as completely as possible. Among these objectionable substances are oxygen, nitrogen, and sulphur, which exist in various combinations, and, unless removed from the finished product, greatly impair its quality.

A number of raw materials are available in the manufacture of illuminating gas. Almost every combustible body, when subjected to destructive distillation, yields gaseous products suitable for generating light. Coal, wood, peat, oil, rosin, fats, bones, and a variety of other substances, have been used; but, generally speaking, bituminous coal may be said to be, *par excellence*, the natural source of gas; and as such we find it almost universally employed, although the other substances above mentioned are sometimes used when local considerations render their adoption desirable.

Of the coals which are included in the generic term bituminous, there are many varieties, some of which are admirably adapted to the manufacture of gas, while others are of too inferior quality to justify their employment. As a general rule, it may be said that the larger the quantity of volatile matter yielded by a coal, the better it is fitted for the gas works; and yet this rule is not without its important exceptions. The English cannels, which are regarded as the best gas coals, vary in their content of volatile constituents, ranging from twenty-seven per cent in the Washington, to sixty-nine per cent in the Boghead, with a long list, of other coals of the same variety, intermediate between these two extremes. In Great Britain, cannel coal is sometimes used alone as a source of gas, but it is generally distilled in conjunction with ordinary bituminous or caking coals, for the purposes of enriching the gases produced from the latter. This latter variety of coal is the main dependence of the gas works. In this country it is used almost exclusively, the few exceptions being in large cities near the seaboard, where certain proportions of English cannel are mixed with it. The advantages of ordinary bituminous coal consist in the fact that it is cheaper than cannel, and while it yields a gas somewhat inferior in illuminating power, it produces a coke of great excellence, which cannel does not; and as this material is one of the most important residual products of gas works, its quantity and quality are subjects of considerable moment. Moreover, the quantity of sulphur contained in ordinary bituminous coal is generally less than that in cannel, which is a decided advantage.

Most persons are familiar with the appearance of gas works. Located generally on the outskirts of towns, in places convenient either to water or railway communication, their numerous buildings, gas holders, etc., form conspicuous objects. In the manufacture of this illuminating agent, coal in charges of from 120 to 160 pounds is quickly thrown into retorts, which are maintained at a bright red heat, from which the gases and vapors are conveyed away by means of upright iron pipes projecting from the front end of the retorts, and technically known as standpipes. After being charged, the retorts are quickly closed (the lids being luted) and forced against the mouthpiece either by means of a screw or a lever, so that they make a gas tight joint. An improvement in retort lids has been lately introduced in the Dublin gas works, where the lids are hung on hinges and have machine turned edges, which are brought in contact with the mouthpieces of the retorts, which are also turned true, and the necessity for luting is obviated. The lids are gas tight, and are held in position by means of a lever. A single charge remains in the retorts usually about six hours, at the end of which time the lid is removed, and the gas remaining in the retort is ignited, so that it may quietly burn away while the coke is withdrawn. This is accomplished in a few moments, when a fresh charge is thrown in, and the evolution of gas goes on almost without intermission.

From the standpipe the gas passes through the dip pipe into the hydraulic main, which is a large tube or trunk, usually made of cast iron, extending along the whole length of the retort house. The dip pipes terminate in this main, their extremities extending three or four inches below the level of the liquid in the main, thus preventing the return of gas which has passed the end of the pipe. When the gas works are first put into operation, the hydraulic main is half filled with water, but this fluid is soon displaced by the heavier tar which condenses from the crude gas, so that in a short time the liquid contents of the main consist almost wholly of tar. Through this liquid, the gas bubbles as it is eliminated from the retorts, depositing additions to the fluid contents of the main in the shape of tar and ammonia water, which, by means of suitable pipes regulating their level, flow off to their appropriate receptacles.

From the hydraulic main, the gas, somewhat cooled, but still containing many condensible products, passes on to the condensers; but, as in many works different intermediate efforts are employed to cool and wash the gas, a brief reference to the various steps resorted to in this stage of the process may be advisable; although it must be premised that in many small gas works some of these processes are omitted altogether. In some instances, the gas is caused to pass through a depth of several inches of water, which removes a portion of the ammoniacal products, and causes a further deposition of tar; while sometimes the gas is *scrubbed* by being compelled to pass through layers of moistened coke, and at others, subjected to streams of water conveyed through rose jets. Many engineers, however, still oppose the use of the scrubber, or any direct contact of the gas with water, the reason alleged being that this treatment reduces its illuminating power. The condenser proper, in which the final cooling takes place, consists of a series of upright iron pipes, sometimes exteriorly cooled by water and sometimes by air.

By these methods of cooling, the gas which leaves the hydraulic main in a heated condition is discharged into the purifiers at a temperature but little higher than that of the atmosphere—sometimes, indeed, where water condensation has been used, below it.

The earliest method of purification, known as the wet lime process, was introduced by Mr. Clegg, an eminent English engineer, whose practical mind soon became convinced of the necessity of removing the noxious products of the combustion of gas, by the influence of which much damage was done to pictures, gilding, and other ornamental objects. By this process, ordinary caustic lime was mingled with water in the proportion of one bushel to forty-eight gallons, and through this mixture the gas was compelled to bubble As far as efficacy was concerned, this method of purification was satisfactory; but in the economy of manufacturing operations, it was found that the pressure upon the retorts, which was induced by the gas being compelled to pass through several inches of liquid, caused a decomposition of the richer hydrocarbons, and a corresponding deposition of carbon in the retorts, as well as creating a variable amount of leakage from the latter. These objections resting on valid grounds, endeavors were made to obviate them, which was accomplished by Berard, who introduced purification by means of dry lime. The apparatus required by this modification consists of a series of receptacles, generally square in form, in which are placed a number of trays, containing moist slaked lime, spread in layers of two or three inches in thickness. Through this substance the gas is passed, and when it emerges, after having traversed successive layers, it is finally discharged into the gas holders, whence it is distributed to consumers.

From the foregoing brief and, in the absence of illustrations, necessarily imperfect description of the manufacture of gas, it will be seen that the process is comparatively a simple one, and yet there are questions, continually presenting themselves in the routine of operations, which demand no little scientific and practical knowledge; hence we generally find gas works placed under the supervision of persons of more than ordinary intelligence. In our large cities, gas engineers are generally selected on account of their scientific attainments, which include not only a reasonable acquaintance with the principles of chemistry, but more especially a knowledge of the physical properties of fluids, practical experience in the construction of buildings, furnaces, and the like, together with such other branches of information as are constantly required in the business. In England, and in all countries where large gas works abound, the profession of gas engineering includes among its votaries men of the highest culture and education; and the literature of this branch of technology has been enriched by contributions which are indispensable in every well appointed scientific library.

The Band Saw.

The band saw, we believe, is an English invention; but it has been naturalized and improved in this country, with practical results of an astonishing character. Among the examples of the capabilities of the band saw, perhaps the best are to be found at the large establishment of Van Pelt & Co., Tenth street, East river, in this city. Mr. Allen Ransome lately read a paper, before the Institute of Civil Engineers of London, embodying some of his observations during a visit to the above establishment, from which we gather the following:

The "band saw" is made of the very best steel, in the shape of an endless band, on one edge of which the "teeth" are set all the way round, and varying in length and width, according to the particular kind of work which is required. This endless saw blade is mounted on a pair of wheels attached to a perpendicular beam or upright, termed a "king post." These wheels are seventy-five inches in diameter, and are made of wrought iron, their peripheries being faced with wood, over which is a tire of leather, a combination which secures three very important requisites, namely, strength, lightness and elasticity. The upper wheel, tension governor, feed gearing, shafts, etc., are attached to the king post, near the ceiling and completely out of the way; while the lower wheel, with its shaft, bearings, and a break are attached to the same king post, but situated in a pit beneath the flooring, and so secured against accident or danger. All the sawdust drops into this pit, whence it is conveyed by means of an exhaust fan to the furnaces in the engine room, to be used as fuel, thus keeping the place clean and free from sawdust. The fly wheels on which the endless band saw revolves have their axes about twenty-three feet distant from each other, so as to produce the necessary tension on the saw blade; but the operator is enabled, by means of a device known as the "tension governor," to increase or lessen the distance between the axes of the fly wheels, thereby decreasing or diminishing the tension on the saw blade as may be necessary The "saws" are constructed with a special view to the sawing of ships' timbers, which require to be sawn with the grain of the wood. The machinery is so adjusted that, by a peculiar arrangement, the operator can instantly remove the saw and replace it by a newly filed one whenever it is necessary to do so. These mills are not ordinary lumber saw mills; nevertheless, the proprietors, by way of practically testing the capability of the machinery, have done considerable log sawing. The results prove that the "band saw" far surpasses all that was expected of it. It will cut a pine log two feet deep at a feed rate of thirty feet (linear measurement) per minute, walnut lumber at about the same rate of speed, and hard oak about one half as fast. It will cut deeper lumber at a proportionate rate of speed. George Law, Esq., the eminent merchant, sat on a log in the mill several hours one day, in company with a United States engineer and two eminent civil engineers, watching the working of the band saw driven by a sixty-five horse power engine. They timed the saw, and found, as the result of their observations, that it cut through a twenty inch log at the rate of thirty-four lineal feet per minute. Mr. Van Pelt then boasted that it could do what no other saw had ever done, namely, cut a quarter inch board from off a wet pine log, forty-two feet long and eighteen inches deep. The other gentlemen declared that they believed it impossible; but the experiment was successfully accomplished at the rate of twenty-five feet per minute, and without the least variation? One of the gentlemen present—an English engineer—expressed his astonishment, and said: "It appears to me that you Yankees can do almost anything you please." The quality of the work is unexceptionable; the boards or planks are cut out perfectly true, straight, and of uniform thickness throughout; and it effects a considerable saving of lumber, because of the very narrow kerf, which varies, according to the thickness and set of the saw blade from one sixteenth to one eighth of an inch.

A New Method of Nickel Plating.

Dr. Wolcott Gibbs gives, in the January number of the *American Journal of Science*, a brief description of a new process for plating various metals with nickel without the use of a battery, which process was devised by Professor Stolba. Into the plating vessel—which may be of porcelain, though the author prefers copper—is placed a concentrated solution of zinc chloride, which is then diluted with from one to two volumes of water, and heated to boiling. (If any precipitate separates, it is to be redissolved by adding a few drops of hydrochloric acid.) As much powdered zinc as can be taken on the point of a knife is thrown in, by which the vessel becomes covered internally with a coating of zinc. The nickel salt—for which purpose either the chloride or sulphate may be used—is then added until the liquid is distinctly green; and the articles to be plated, previously thoroughly cleaned, are introduced, together with some zinc fragments. The boiling is continued for 15 minutes, when the coating of nickel is completed, and the process is finished. The articles are well washed with water and cleaned with chalk. If a thicker coating be desired, the operation may be repeated. Professor Stolba found that copper vessels thus plated were scarcely tarnished after several months' use in the laboratory.

THE worst misfortune is to be unable to bear misfortune.

KENWOOD TOWER, HIGHGATE, NEAR LONDON.

Highgate is situated on a hill in the northern suburbs of London, 400 feet above the level of the sea, and for a long time was a mere hamlet of houses scattered here and there amid the forests. It was not till the fourteenth century that the Bishop of London allowed a highway to be cut through his park and woods of Harringhay (the hare-inge-hayh, or meadow and wood of hares). A gate was erected and toll taken, and the place is said to have been called Highgate from this gate; but what was the name of the place before that time is not known.

The chapel of Highgate, which occupied the site of a hermit's cell, was granted by Bishop Grindal, afterwards Archbishop of Canterbury, in 1565, to a new grammar school, erected and endowed the year before by Sir Roger Cholmely, late lord chief justice. This was pulled down many years ago, and the church built in another part of the village. Among the tombs, however, was that of Coleridge, the poet and philosopher. The church was built in 1832, at a cost of 10,000*l*., in the parish of St. Pancras; but Highgate was soon afterwards made a district of itself.

The unfortunate Richard II. was conveyed through Highgate, in 1398, on his way from the north, by his haughty rival, Bolingbroke, hooted by the rabble. In 1461, Thomas Scrope, baron of the Exchequer, was beheaded by the insurgents in Highgate. In 1745, the London train bands marched through Highgate to encamp on Finchley Common, to defend the metropolis against Prince Charles and the Scots.

Coleridge settled at Highgate, in the house of Mr. James Gillman, surgeon, about 1800. At an early period he had used opium, and could not shake off that unhappy bondage. His physical strength gave way, and his mind was unstrung. "Here," as Carlyle says, "he sate looking down on London and its smoke tumult, like a sage escaped from the inanity of life's battle, attracting towards him the thoughts of innumerable brave souls still engaged there,—heavy laden, high aspiring, and surely much suffering man." During this time he continued his literary work, and was visited by many of the chief literary men of the day. He died July 25, 1834, aged 61.

Mr. MacDowell, the sculptor of the "Reading Girl," resides at Highgate. His sculptures of "Love Triumphant," and "Death of Virginia," executed for Mr. Wentworth Beaumont, place him in a high rank in the artistic world. His son is a young sculptor of promise. In the old coaching days, travellers for the north stopped at Highgate, and, at whichever of the nineteen public houses it might be, "out came the horns, fixed on a pole, and the passengers were sworn to eat no brown bread when they could get white, unless they liked it better, and not to kiss the maid when they could kiss the mistress, unless they liked her better," and a lot of other nonsense. This probably relates to the old passage toll levied on horned cattle, and gathered by some park keeper, who carried a staff with horns to show his authority.

At Fitzroy Park, an outskirt of Highgate, Dr. Southwood Smith lived, a very modest and clever man of science. He was physician to the London Fever Hospital, and wrote a valuable "Treatise on Fever," also "Animal Physiology," for the Society for the Diffusion of Useful Knowledge. In 1837, he was appointed by Government to inquire into the state of the poor, and many sanitary reforms resulted from his investigations. Dr. Smith died at Florence in 1861, and was buried in the Protestant cemetery there.

Highgate has retained more of its rural character than any other village in the suburbs of London. It has its old buildings, and elm and lime tree avenue; and around it stretch fields and hills.

Oliver Cromwell built Cromwell House, a solid red brick mansion, about the year 1630; but he is thought never to have made more than an occasional visit to it. Prickett, in his "History of Highgate," says: "Cromwell's house was evidently built and internally ornamented in accordance with the taste of its military occupant. The staircase, which is of handsome proportions, is richly decorated with oaken carved figures, supposed to be of persons in the general's army, in their costume, and the balustrade filled in with devices emblematical of warfare. On the ceiling of the drawing room are the arms of General Ireton; this and the other ceilings of the principal apartments are enriched in conformity with the fashion of those days. The proportions of the noble rooms, as well as the brickwork in front, well deserve the notice and study of the antiquary and the architect."

This classic spot, replete with so many historical associations, is the site of Kenwood Tower, now being erected for Mr. Edward Brooke, a wealthy citizen. It is a fine example of modern architecture. It will have the external walls faced with Loughborough red bricks and rubbed Reading red brick quoins, all the dressings of the windows and other stonework being of Doulton freestone. The chimney shafts will be of various patterns, and built up in small molded bricks. The roofs are to be covered with ornamental red and dark grey tiles. The dining room will have a moulded and carved ceiling in wainscot; also dado doors and window jambs, all of wainscot framing, molded on the solid. The floor is parquetry; the chimneypiece will be modelled and carved, with various woods and marbles; it will be the whole hight of the room, and worked into the cove of the ceiling. The principal staircase is to be of wainscot, carved, of Elizabethan design, with an open timbered, ornamental roof, colored. The billiard room, ante-hall, and principal hall will be fitted up with pitch pine, of similar design to the dining room. The upper portion of the windows in the ground floor rooms is to be filled with stained glass, the subjects to be suitable to each room. There will be a stained glass window, too, on the principal staircase, filled in with the armorial bearings of the Brooke family; in the hall, large stained windows, with subjects from well-known fables. Polished marble columns and carved capitals are used inside, both in staircase, hall, and drawing room. The conservatory and vineries will have an entrance from the dining room.

Fish Culture in New York.

The Commissioners of Fisheries for the State of New York are now delivering fish and spawn for the stocking of public waters within the State, and the following particulars and directions concerning their method of operations may be of general interest to our readers. Mr. Seth Green, the State Superintendent, Rochester, N. Y., says:

The impregnated spawn of salmon trout and white fish can be sent in October, to such places as have conveniences for hatching it.

Young white fish are in condition to transport from the 1st to the 10th of February; salmon trout, from the 10th to the 20th.

Oswego bass, strawberry bass, white bass, rock bass, and a limited number of black bass, pike perch or wall eyed pike and bull heads can be delivered at Rochester at any time during the winter.

Milk cans are used for carrying white fish and salmon trout; and milk cans and pounding barrels, or other clean barrels, are suitable for carrying other kinds of fish. A five gallon milk can will hold two thousand white fish, or one thousand salmon trout; or from twenty to one hundred of the other fish above named, according to their size.

The wall eyed pike, rock bass, white bass, black bass, white fish and salmon trout are suited to clear waters with rocky bottoms where the crawfish is to be found, and Oswego bass, perch, strawberry bass, and bull heads will only live on muddy bottoms with flags and pond lilies.

It is almost useless to stock rivers which overflow their banks and flood much extent of country, as the fish are stranded by the receding waters, and get into pond holes, where they perish in dry weather.

All fish should be deposited as near the head of the lake as possible, so they will not go into the outlet before they become familiar with the waters. The fish should be deposited during the night, when most large fish do not feed, and will find hiding places before morning.

SOAP.—A young lady, who makes all the family soap, gives the following recipe for a good cheap article: Add to 10 quarts of water, 6 pounds of quicklime (shell lime is best), and 6 pounds common washing soda. Put all together and boil for half an hour, and let it stand all night to clear. Draw off the lye, and add to it 1 pound common resin, and 7 pounds of fat (any fat will do). Boil this for half an hour, then let it stand till cool, and cut into bars.

KENWOOD TOWER, HIGHGATE, NEAR LONDON.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The Effect of a Grain of Strychnine.

To the Editor of the Scientific American:

In your edition of Dec. 16th, page 389, is described the effect of a grain of strychnine which had been swallowed for the purpose of committing suicide. The writer has given an account of the sufferings produced by that poison, and, because the patient was "saved by the skill of his physician," thinks the publication of the case useful "for the benefit of science." In view of the fact that the symptoms produced by strychnine are not unknown, and that the remedy which the doctor employed has not been mentioned, I am really at a loss to comprehend in what manner science has been benefitted by the publication of that case.

About ten years ago, I was called to visit a friend of mine who had swallowed about a similar dose of strychnine, mistaking the bottle containing it for one holding a solution of morphine, which he intended to take against toothache. The symptoms, produced by that dose of strychnine, were about the same as described in the above mentioned article, with the addition that the patient thought the whole room (on the floor of which he was lying) to be on fire. Though not knowing the cause of those frightful spasmodic convulsions, I suspected strychnine, and immediately administered chloroform by inhalation, keeping the patient under its influence during twelve hours, till the spasms ceased to return. About a pound of chloroform had been used. The patient was saved."

So much for "the benefit of science," and more for the benefit of those who, by accident, might fall into the destructive grasp of one of the most powerful poisons known.

In the same number of your journal, there is another article, treating of toothache and earache, which gives a good deal of negative advice as to what should not be done in such cases. Let me give your readers a positive advice in recommending a remedy which will never fail to remove the pain in a few minutes, and which consists in a hypodermic injection of a solution of one eighth or one sixth of a grain of the acetate or chlorate of morphia, applied under the skin of the arm or leg. If care is taken to introduce the solution deep into the tissues, no abscess will follow.

M. SCHUPPERT, M. D.

Gold and Platinum Alloys.

To the Editor of the Scientific American:

I desire to make known, through your valuable paper, a remarkable phenomenon, in connection with an alloy of gold and platinum. I have entertained the opinion, generally received by chemists and metallurgists, that in the alloys of metals there was a fusion of each metal, and a blending of the particles of each that, for all practicable purposes, has caused the compound to be recognized as one body. How this union was formed, when gold and a small portion of platinum were fused, has been, owing to the high melting point of the latter, a difficult problem to solve. Thinking there might be some method of discovering how metals combine when fused, I made the following experiment, producing a result which is entirely new in the history of the noble metals:

I had a lot of dental gold plates, which had quite a number of small pieces of platinum wire attached, after breaking off the artificial teeth. There must have been about three pennyweights of platinum. The mass weighed nine ounces. I melted and poured the whole into an ingot; it was perfectly fused. On examining the bar closely, not a trace of platinum could be seen. I rolled it through the hand mill, extending it to three yards in length; then cut it in pieces three inches long. I then exposed it to the action of acids, in a manner entirely different from my usual method when refining gold for foils. After a few hours chemical action, I observed a bright metallic point gleaming through the bars of a crystal cage, which a glass blower made for me for this special case. I took it out, and, on examination, I found it to be platinum. I placed it back again for further action; and, on its final removal, I have now a demonstration in a friable mass in which are seen six pieces of platinum as clear and perfect as if they had been rolled in a mill, and they are retained together by the undissolved gold, to convince parties who otherwise would conclude such a result to be impossible. This is the first experiment I have made with arrangements devised by myself; what my success may be with metals lower in the scale, further experiments will eveal.

That your readers may appreciate the scientific value of my discovery, it may be well to quote the latest scientific conjectures respecting the combination of metals in fusion and solution. I quote from Fowne's "Chemistry," page 270, (Phil. ed.): "But though metals may combine when melted together, it is doubtful whether they remain combined after the solidification of the mass; and the wide differences between the melting and solidifying point of certain alloys, appear to indicate that the existence of these compounds is limited to a certain range of temperature. Matthiessen regards it as probable that the condition of an alloy of two metals in the liquid state may be either that of: 1st, A solution of one metal in another; 2d, chemical combination; 3d, mechanical mixtures; 4th, a solution or mixture of two or all of the above; and that similar differences may obtain as to its condition in the solid state."

My experimental result demonstrates that there is, in relation to gold and platinum, no chemical union, no mechanical mixture; but that the platina melts and arranges itself in small globules, distinct from one another, retaining their integrity in the melted mass. In view of my discovery, I know the chemist and metallurgist will ask me: What new solvent have I found that dissolves gold, and yet leaves the platinum undissolved at the same time? I desire making further experiments before fully explaining my methods.

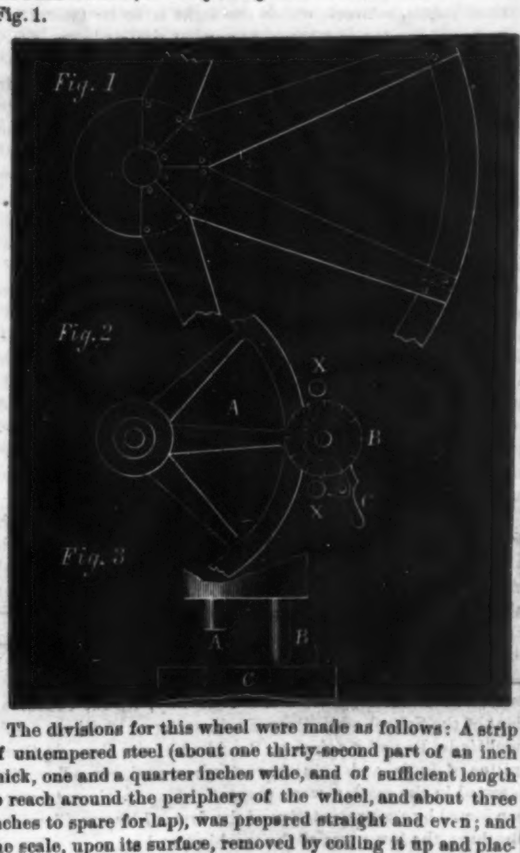
Cincinnati, O. JAMES LESLIE.

[The specimens sent are evidently globules of platinum, flattened and elongated by rolling into miniature spear heads.—ED.

A Dividing Engine.

To the Editor of the Scientific American:

I know not what degree of perfection has been attained in the construction of engines for dividing the circle into equal parts, but I think it would be difficult to improve upon the accuracy of the method recently adopted here for graduating the dividing wheels of a large gear cutting engine. The engine was designed for cutting gears of large radius, both bevel and spur, and is now in use for that purpose. It is constructed upon the wheel and pinion principle, the dividing wheel being some four feet diameter, and having, I believe, 360 teeth in its periphery. Before these teeth were cut, the engine was fully completed and the wheel fixed permanently upon its arbor and in its working position in the machine, where its periphery received its final facing off preparatory to the cutting of its teeth. The cutter head was then accurately adjusted in position for cutting the teeth, upon a firm but temporary rest. A temporary dividing wheel was then firmly and truly fixed upon one end of the same arbor. To insure greater accuracy, this dividing wheel was made much larger than the one to be cut (some eight feet diameter, I think), and to save the expense of a pattern for such a wheel, it was put together as shown in the section Fig. 1.



The divisions for this wheel were made as follows: A strip of untempered steel (about one thirty-second part of an inch thick, one and a quarter inches wide, and of sufficient length to reach around the periphery of the wheel, and about three inches to spare for lap), was prepared straight and even; and the scale, upon its surface, removed by coiling it up and placing it for a short time in dilute sulphuric acid; it was then washed, dried, and oiled. The removing of the scale was nece sary in order to preserve the integrity of the punch used in punching a central row of 364 holes along the whole length of the strip, the four extra holes being for the purpose of insuring a perfect job in tapping the ends, as the coincidence of several pairs would be more reliable than the coincidence of one pair of holes. Perfect equality in the distance between the holes was preserved by using two punches in the same plunger, as shown in Fig. 3, A, the punch proper, and B the gage punch; the gage punch being long enough to enter the die, C, fully before the punch, A, made its hole, and large enough to slightly burnish the holes as it enters them. The utmost care was, of course, necessary in this part of the process, namely, the preparation and operation of the punching machine; uniform temperature in the room where the work is done, will, of course, contribute to the perfection of the job.

The punching being completed and the ends properly chamfered for the tap, they were kept in position for fastening by placing a pin (just the size of the gage punch) in each pair of the coincident holes; the ends being secured, the pins were removed, and the hoop, with its 360 holes, was ready to placed upon the wheel; before this was done, however, a groove was turned in the periphery of the wheel, so that the stop points could not bottom when they entered the holes in the steel hoop. For the purpose of greater accuracy, several stop points, each independent of the others, were used, all of them pressing equally upon the wheel; but so arranged as to be operated all at once by a single motion of a lever. Much care was of course bestowed upon every part of this preparation before the cutting was commenced; the workman then passed three times round with the cutter, as in ordinary gear cutting; the first cut removing about three quarters of the stock between the teeth, the second one left very little for the finishing cut.

Uniform temperature was maintained in the room during the operation.

The method of working the dividing wheel of this class of engine is as follows: Fig. 2 shows the arrangement, A being the dividing wheel, and B, the dog wheel and pinion, both upon the same arbor; the pinion beneath the dog wheel is indicated by a dotted circle. A number of these dog wheels are required, of course, in order to produce all of the numbers required in the business of gear making, and they are made exactly alike, with the exception of the number of notches in their periphery. They are so fitted to the pinion arbor as to be quickly changed, and yet so as to work the pinion without the least slip. The dog handle, C, works between two stops, X X, one of which is adjustable, to gage the movements of the handle to the number of teeth to be cut. The number of teeth in the dividing wheel should of course be a multiple of other numbers; a multiple of twelve ending with a cipher is usually employed. If 360 is the number of teeth in the dividing wheel, 30 may be the number of teeth for the pinion.

All of the numbers of which 360 is a multiple may of course be produced without the pinion and dog wheel, such as 180, 120, 90, 72, 60, 54, 40, 36, 30, etc.; but in order to produce the intermediate numbers, the differential agency of these wheels is necessary; for instance, if a gear with 31 teeth is wanted, the pinion must make $\frac{11}{31}$ of a revolution (or its equivalent, as $\frac{22}{62}$ or $\frac{33}{93}$) for each tooth cut; consequently if the dog wheel contains 62 notches, it must of course be moved 24 notches for each tooth cut. To ascertain what numbers may be produced by any dog wheel, multiply the number of notches the wheel contains by 12, and the product is a multiple of the numbers the wheel will produce. For instance, $62 \times 12 = 744$; this product is the multiple of 372×2, or 186×4, or 124×8, or 93×12, or 62×16, or 31×24.

I make this arrangement of the numbers because they are stamped in this order on the face of the dog wheel, to indicate that a movement of 24 notches for each tooth cut will produce 31 teeth, and that a movement 31 notches for each tooth cut will produce 24 teeth, and a movement of 16 notches will produce 62 teeth, and a movement of 62 notches will produce 16 teeth, etc. Each of the dog wheels belonging to the machine has its peculiar set of numbers stamped upon its face, of course.

Gear cutting engines of this class are very handy and serviceable, and are operated with great facility.

F. G. WOODWARD.

The Educated Ear.

To the Editor of the Scientific American:

Your article on the education of the ear "reminds me of a little story." Years ago, I was an apprentice to a watchmaker, and we had many clocks to repair, averaging, I think, forty. I slept in an adjoining room. After being there a few months, my ears became detectives. When a clock stopped in the night, I would instantly awake, aware of the stopping, no matter how many clocks were running. This became very vexatious. Where so many old clocks were being repaired, it was inevitable that many would stop; and it is a matter worthy of remark that there are more stoppages of such machines in the night than there are in the day time.

At that time I could awake at any time I might wish to; for instance: It is 11 o'clock at night; I am about to retire; I wish to arise seven minutes before five, or at any other particular minute. I would go to bed, sleep soundly until the precise minute, and then answer, "wide awake."

If this was not educating the ear, what was it? A.

[We have doubts as to the correctness of our correspondent's opinion that more clocks stop at night than in the day time. The fact that some persons are able to wake from sleep at a particular hour is one of the mysteries of a yet unsolved mystery. Until we know more of the nature of sleep, it is useless to speculate in regard to its phenomena.—ED.

Builders' Hardware—A Demand for Better Material.

To the Editor of the Scientific American:

I wish that something were said and done to correct the bad practices of some of the manufacturers of builders' hardware, such as nails, screws, hinges, latches, locks, window pulleys, hooks, etc.

I presume that there is not a house carpenter in the country who has not had his patience tried by the poor quality and frequent failure of some of these articles.

Nails, as brittle as cast iron, are quite common articles; the iron of which some of them are made is so poorly welded that they often split by the first stroke of the hammer. Our American screws, in form and finish, are all that need be desired, and yet the material of which some of them are made is so poor that their heads snap in the act of screwing them into soft pine; the round headed ones are especially liable to this fault. The square corner under the head is unfavorable to strength, and a round corner or trumpet form would greatly improve their strength at this point; the slots in some of their heads are so shallow that they are useless until they are reslotted. Those brilliant mineral and porcelain knobs, which add such a pleasing feature to the finish of our doors, frequently jar off from their metal sockets for the want of a stronger and deeper dovetail to the sockets; and the sockets are continually getting loose upon the square shanks for want of a snug and proper fit to the screws that hold them on. The rivets that hold the cheeks to the window pulleys are often so slightly headed that the cheeks spread as soon as the weight is applied.

These are some of the defects which sometimes try the

patience not only of builders and housekeepers, but of everybody who is able to raise a window or open a door. It would cost no more to make these things of good material and strong and serviceable at the points I have named, than it does in the present faulty manner.

It is a matter of considerable importance; and if the manufacturers could appreciate it, as some others do, I think our hardware stores would soon cease to be encumbered with these demoralized articles. F. G. W.

[For the Scientific American.]

EXPOSE OF THE TRICKS OF THE DAVENPORT BROTHERS.

BY P. H. VANDER WEYDE.

[Continued from page 57.]

After the feat of throwing the speaking trumpet through the small hole in the middle door, for which the mouth is used, a few musical instruments are played in the box, a guitar, violin, etc., and a kind of performance takes place on them; at first the strings are only hit at random, such as any one may do by hitting them with the knees or elbows, or by taking the violin bow in the mouth and hitting the loose strings. The believers in the supernatural are delighted with the music performed by the supposed spirits; they declare it to be of a different kind to any executed, even by the most accomplished performers; and in this opinion they are perfectly right.

In the meantime, one of the brothers is working himself loose, by which he is most especially assisted by the smallness of his hands, so that he may soon slip one hand through the usually clumsily tied knot of the rigid manilla rope; as soon as this is done, the rest is easy, and more perfect performances may be indulged in; while, in the meantime, the brothers are from time to time shown to the audience, by opening the doors, of course taking care on each occasion to place the hands behind their backs as if they were still tied up.

I wish here to call attention to the all powerful capacity of the small pliers, such as wire workers use to cut wire with, in loosening the most tightly fastened knots. They must not be sharp enough to cut the rope, but must only take a strong hold; no knot can resist the application of one, or, better still, of two such pliers. It is more than probable that the Davenports are provided with them, and the only real difficulty they may encounter is to get the first hand so far loosened that it can handle the pliers; the rest is then easy. When I was called, by the wish of the audience, to tie one of them, I took my own hemp rope, and used it so effectively that more than an hour elapsed before they were loose; little time was thus left for other performances, and the exhibition of that night, at least, turned out a partial failure, several parts of the programme being omitted.

When the ropes at last, by their continued labor, are totally loosened, all the doors are opened, and the brothers exhibited standing with the ropes laying at their feet. After this preliminary performance, they tie themselves, and then the principal feats are performed, because they tie themselves in such a way that they can slip out their hands at any time, and slip them in the knot again in a few seconds. In order to teach any one to do this, I will describe it minutely: Take a rope of suitable length, and tie the ends around your feet with plenty of heavy knots, so as to leave the middle part of the rope free for the length of about three or four feet; pass this middle part behind the seat of the chair, or through the hole with which the wooden seat in their box or closet is provided. You thus obtain a loop which will be loose when you bring your feet backward, and tight when you bring them forward; through this loop, when loose, you may stick your hands, twist them round a few times, so as to produce an apparent knot near the hands; and then, by bringing the feet forward, the knots appear to be tied down. All this, of course, is done out of sight of the audience. When ready, the doors are thrown open, and the unwary public is surprised to see the hands tied behind the back, and the knots on the feet; and, taking it for granted that the knots were tied after the hands were fastened, the only conclusion of believers in spirits is that the spirits tied the knots. If now they want to take off their coats, the doors are closed, the feet brought backward, which loosens the loop, the hands are twisted back and slipped out, the coat is taken off, the hands are slipped in again, twisted round, and the feet brought forward, which tightens the rope, and the doors are opened. This takes very little time, and, by continual practice, the Davenports do it very rapidly. Of course, in this way, they can do anything—stick their hands through the hole in the door, put them on the head or face of any timid individual they take in their dark box, or play on instruments; and every time that their hands are passed through the loop, they withdraw the bolt and allow their assistant to open the doors and exhibit them to the public, who thus sees them only when they are tied down.

I have performed these tricks at that time repeatedly, and done everything that the Davenports did; it surprised those present before it was explained; of course, after the explanation, all interest ceases.

Before closing, I wish to remark that experience shows that the public is willing to pay for being deceived and amused, but not for being enlightened. This was proved by a certain person, whose name I have forgotten; and who, immediately after the close of the Davenport performance, hired the same hall and spent the required amount of cash to advertise that he was going to reveal all the tricks of the Davenports. The attendance was so small that he lost as many hundred dollars as every night were made by the Davenports. However, I saw that he had, after all, not found out the true *methodus operandi*; he spoke only generally against spiritualism, referred to hidden springs, movable seats, etc.; and his lecture was a failure, in so far as he intended to explain any details of the feats performed. But even if he had given the true explanation, success would not have been better, and his experience was a lesson to those who perhaps felt inclined to enlighten the people in place of deceiving them. The old saying of the heathen Roman priests, "*Mundus vult decipi, decipiatur ergo*," holds, alas! still good in our so-called enlightened nineteenth century.

The Electric Light.

On the 18th ult., a series of experiments was made at Sheerness with a view of ascertaining the applicability of Siemens' dynamo-electric light to torpedo service in time of war. The scientific combination is produced, as its name signifies, by the application of excessively rapid motion generated from the fly wheel of a steam engine to a very powerful set of ordinary galvanic coils in connection with soft iron magnets. The leather strap from a four horse power engine, encircling a small gun metal pinion, causes it to revolve with the extreme velocity of 1,600 revolutions per minute, inducing motion in an electric bobbin at the side of an apparatus consisting of several sets of strong insulated coils. A stream of electricity consequently passes through them. This stream is conducted to a second series of coils, larger and more powerful than the first, which are also in combination with a pinion revolving 800 times per minute, thus intensifying the stream as it passes through them to a very considerable degree. Both negative and positive currents are now alternately given off, from another bobbin at the side of the second series of magnetic coils, to the train of insulated wires, which conveys them to the position from which the dynamo-electric light is to be exhibited. Here there is a delicately contrived apparatus for containing the carbon points, between which the light is to be generated, adjusted at the top of a tripod somewhat similar in construction to that of a surveying instrument. At the back of the two carbon points, and slotted vertically to admit of their holders passing through it, is a concave reflector of white polished metal, which collects the rays of light into a focus and transmits them in any required direction by means of an adjusting hand wheel below. A minute aperture in the center of the reflector, precisely behind the junction of the two carbon points, throws a representation of the flame upon a piece of opal glass in a frame fixed at the back of the reflector; and through the agency of another small hand wheel, which causes the carbon points to approach or recede from each other, the flame can be reduced or intensified at pleasure, by simply turning the wheel, care being taken at the same time to keep a watchful eye upon the picture produced, as the withdrawing of the points to too great a distance from each other will extinguish the light. It should have been remarked before that ample means are taken, by lubricating the electrical apparatus, to counteract the evil effects which might otherwise arise from the excessive friction consequent on the rapidity of motion in the several parts.

The object of instituting the series of experiments which were made was to ascertain if it was possible to throw such a stream of light upon an enemy's working parties (engaged in interrupting communications), with a line of torpedoes at night, as would render them sufficiently conspicuous to be fired at and consequently driven off. The place selected was the new fort at Garrison Point, Sheerness.

Colonel Nugent, R. E., the President of the Torpedo Committee of Great Britain; Colonel Galway, R. E., Commandant of the School of Military Engineering at Chatham; Colonel Hyde, Bengal Engineers, President of the Torpedo Committee of India, and a number of other engineer officers interested in the matter, were present. The experiments were conducted by a representative of the firm, of Messrs. Siemens, Brothers, the inventors of the machine, and were superintended by Lieutenant Anderson, R. E., secretary to the Torpedo Committee. The engine and coils were erected in the enclosure of the fort, while the instrument itself was placed in one of the massive embrasures piercing its sides. No sooner was steam got up and the order given to turn ahead, than the burring noise of the machine indicated that electricity was being rapidly generated, sparks and stars of vivid blue light being given off at the various joints. Another instant, and a vivid stream of light shot across the sea to a number of ships lying in the offing at a distance of about two miles, lighting them up with the brilliancy and distinctness of broad moonlight. The effect was magnificent. Clouds of mist, rendered visible by the intensity of the rays shooting through them, rolled across the broad field of bright light from time to time, not, however, interrupting the view in their progress. By shifting the direction of the rays laterally, each object in turn came within the compass of the portion of horizon rendered clear. In fact, it was sufficiently apparent that no objects of any appreciable size, such for instance as an enemy's boats, could come within a mile or more of one of Siemens' dynamo-electric instruments in operation without being rendered conspicuous to any battery in the vicinity, and consequently involving to themselves the most imminent danger. Hence the result of the experiments may be pronounced a success; whether, however, a corresponding effect might not be obtained by a succession of parachute lights thrown from a rocket or mortar is quite an open question.—*London Artizan.*

THE man who will distance his competitors is he who masters his business, who preserves his integrity, who lives clearly and purely, who devotes his leisure to the acquisition of knowledge, who never gets in debt, who gains friends by deserving them, and who saves his money.

Improvement in Roofing.

This invention consists in a novel arrangement of covering and protecting devices for ventilating passages at the peak of a slanting roof made of boards and cleats, running from eaves to peak, and having grooves in the boards near the edges under the cleats for conveying the water away. The ventilation is required to prevent the water from settling back in the grooves by the melting of snow at the peak in consequence of the accumulation of heat thereat when not allowed to escape, while the water freezes at the eaves and sets back.

The roofing boards are placed side by side from the eaves to the ridge on joists, stretching from one to another of the rafters, the boards being placed so that the edges do not quite meet to allow for expansion. The upper ends are placed a short distance apart to allow air to pass from the grooves and cracks to an escape passage, and are grooved near the edges to prevent the water from running to the joints under the cleats, which cover the joints between the boards.

The boards are fastened at the center only, and the screws or nails which fasten the cleats pass down through the cracks, so as to leave them free to expand and contract without hindrance from the fastenings, which would cause the boards to split if applied to them at the edges.

Air is fully admitted in the grooves and openings under the cleats, and carries off all moisture arising from damp or wet weather, which makes this combination durable. Escape passages are made in the upper ends of the boards, between the cleats, for the escape of the heated air, and vertical plates are placed below them. Metal angle plates are placed over them, to prevent the rain and snow from falling into the passages, and the vertical plates prevent the beating up to the passages under the angle plates by the wind. By thus ventilating these roofs at the ridge, it is claimed the danger of leakage by back water is avoided. Mr. Melvin J. Earl, of Mannsville, N. Y., assignor to Polly M. Earl, of Ellisburg, N. Y., is the inventor of this improvement.

Improvement in the Manufacture of Sugar.

Messrs. George A. Drummond and Thomas Sterry Hunt, of Montreal, Canada, have just obtained a patent, through the Scientific American Patent Agency, for a process of removing iron or other injurious metal from sugar. For this purpose they employ a mono-sulphide of one of the alkaline earths, such as calcium, strontium, or barium, in conjunction with sulphate of magnesia.

To the solution of sugar or the sirup, milk of lime is added so as to make it slightly alkaline. Then the prepared sulphide of barium, calcium, or strontium, either in powder, or, by preference, dissolved in water, is added, thoroughly stirring the whole at the temperature of between 100° and 150° Fah.

If the solution now gives a dark color to paper moistened with acetate of lead, the quantity of sulphide is sufficient. If not, more must be added. A quantity of sulphate of magnesia in solution is then added, at the rate of one and a half pounds for every pound of sulphide of barium, or for every half pound of sulphide of calcium. The whole is thoroughly incorporated and heated.

A small quantity of blood or albumen facilitates subsequent filtration. The whole is now passed through a filter, and is then ready for the subsequent process of refining. The amount of sulphide to be used will depend upon the impurity of the sugar or sirup, but will not exceed, in most cases, two or three pounds of sulphide of barium, or about half that quantity of the sulphide of calcium, to the tun of sugar.

The theory of the process is as follows: The iron or other metal, held in solution as oxide in the sirup, is converted by the sulphide of the alkaline earth into sulphide, which is insoluble. The subsequent addition of the sulphate of magnesia converts any excess of the alkaline sulphuret into a very unstable sulphide of magnesium, while the baryta, if used, is separated as a wholly insoluble sulphate, which, with the sulphide of iron, etc., is separated by filtration.

The process may be varied somewhat to suit circumstances, and the ordinary apparatus of sugar refining is usually quite sufficient to carry it out effectually.

Crook's Automatic Oilers for Looms.

This invention has for its object to furnish an improved automatic oiler for looms, so constructed as to keep the requisite parts of the loom all the time properly oiled, thus effecting a great saving of oil and preventing the parts of the loom from being injured by the neglect of the weaver.

The cup, can, or reservoir for the oil, which may be made in the form of an ordinary oiler, or any other desired form, is provided with tubes, one or more of which may be used, and the lower ends of which lead into the lower part of the can. The tubes incline outward and upward, and in them are placed wicks, the inner ends of which enter the cup, and the outer ends of which project from the outer ends of the tubes, to conduct the oil by capillary attraction from the cup to the thing to be oiled. The oiler may be hung from the framework of the loom by having a properly shaped lug attached to it; or it may be placed upon a small shelf attached to the framework.

With a two tube oiler, one tube will oil the two rollers of the picker and the studs or pivots upon which they work, and the said rollers will in turn oil the shoe, making five places oiled by one tube. The other tube oils the small cams, and they oil the lever that works the catches that work the boxes, thus oiling three places, so that a two tube oiler keeps eight parts of the loom constantly oiled. A single tube oiler may be arranged to oil the spindle upon which the picker works. Mr. Joseph Crook, of Ludlow, Vt., is the inventor.

BY bestowing blessings on others, we entail them on ourselves.

New Process for Bread Making.

The object of this process is to increase the amount of bread that can be made from a given quantity of wheat. It does so by dispensing with grinding altogether, and by utilising some of those matters which, under the name of brans, are at present withdrawn from consumption. The inventor does not pretend to rival the quality of the best white bread, but that of inferior quality, technically known as "seconds," and it is to this bread that the following remarks apply.

Given 100 parts of ordinary wheat, grinding converts it into 80 parts of flour fit for seconds bread, and 20 parts of husk and bran. If the miller tries to alter the proportion, by diminishing the weight of the refuse and increasing that of the flour, the bread made from it will be more or less dark-colored in proportion as he has diverged from the recognized rule. Bran forms really only 5 out of these 20 parts, the remaining 15 being made up of fatty and gummy matters, which remain behind, and cannot be converted into flour.

The 5 per cent, which is really the episperme or integument of the grain, is of course useless, and this is the total weight of refuse matter which M. Zézille permits. This is got rid of in his process by such slight friction as arises from shaking the grains together, which he finds sufficient for the the decortication of the grain.

The color of the grain remains unaltered, but the decortication has rendered it fit for treatment with water. Under the outer envelope which constitutes the true bran is found a layer of a yellow substance, almost insoluble in water, and which is blackened by fermentation; this is the gummy matter, cereline. M. Zézille removes this substance by by steeping the decorticated grain for half an hour in water heated to 80° C., decanting the resinous liquid thus produced and again running on hot water. This washing is repeated three or four times in about five hours, the temperature of the liquor never being allowed to fall below 40° C., or starch would be formed. The grain is now found to be slightly swelled, and to have very much increased in weight. In place of 95 kilogrammes it now weighs 160 kilogrammes.

In this phase of the process the wheat is almost white, and can readily be crushed between the fingers. The last operation is to reduce it to dough. This is done by passing it between rollers similar to those of a chocolate mill. It then loses about one fifth of the water it had absorbed, and is reduced in weight to about 145 kilogrammes.

The paste thus obtained only requires the addition of yeast and the ordinary routine of the bakehouse, to become a good wholesome bread.

If the bread is as nutritive, the gain in this mode of bread making is very great, as 145 kilogrammes can be produced from quantity of wheat from which, at present, we only obtain 108-110 kilogrammes. The question deserves most thorough investigation, as its results point to a very great reduction in the price of the most largely consumed of our food stuffs.

The extreme simplicity of the means by which so great and so important a result is said to be obtained is exceedingly likely to provoke opposition and, indeed, incredulity. It will perhaps be said: How is it possible, with so many able experiments, so many skilled workmen, and thoughtful chemists, during so many centuries, that so simple a process has been overlooked and has not long ago been adopted, if it had any real value? But, on the other hand, such reflections do not authorize the curt dismissal, of so important a subject, as a mere chimera. In France the inventor is supported by the testimony of MM. Parville, Payen, Barral, etc.

Long trial, and most careful analysis, can alone decide on the merits of this new discovery; but if, as we hope, it is really sound, its benefits will be reaped by millions.—*Les Mondes.*

On a Simple Remedy for Dandruff.

There are doubtless few persons, especially among gentlemen, who do not suffer from the inconvenience of dandruff. Physicians seem to consider it not of sufficient importance to engage their attention, and the poor victims are left either to practice their virtue of endurance, or for a cure, to try some of the many nostrums advertised in the public prints.

The intolerable itching which frequently accompanies the troublesome complaint, is not the only unpleasant feature, as to persons of any pretensions to neatness, the appearance of the white scales on the coat collar and shoulders is very objectionable.

The writer, during a number of years, tried the different alcoholic solutions of castor oil and many other preparations without permanent benefit, and as a last resort, was led to adopt the plan of cleansing the scalp with borax and carbonate of potassa. This proved effectual, but after a persistent treatment of some months the hair became sensibly thinner, and perhaps would have soon disappeared all together. The belief that dandruff arises from a disease of the skin, although physicians do not seem to agree on this point, and the knowledge that the use of sulphur is frequently attended with very happy results in such diseases, induced me to try it in my own case. A preparation of one ounce flowers of sulphur and one quart of water was made. The clear liquid was poured off, after the mixture had been repeatedly agitated during intervals of a few hours, and the head was saturated with this every morning.

In a few weeks every trace of dandruff had disappeared, the hair became soft and glossy, and now, after a discontinuance of the treatment for eighteen months, there is no indication of the return of the disease. I do not pretend to explain the *modus operandi* of the treatment, for it is well known that sublimed sulphur is almost or wholly insoluble, and the liquid used was destitute of taste, color or smell. The effects speak for itself. Other persons to whom it has been recommended have had the same results, and I communicate the result of my experiments in the belief that it may be valuable and acceptable to many who have suffered in the same manner as myself.—*John L. Davis, in the American Journal of Pharmacy.*

Measurement of the Velocity of Cannon Balls.

A very ingenious instrument, known as Noble's Chronoscope, is used for measuring the velocity of shot during its transit through the gun. The tube of the gun is fitted inside at certain intervals with metal rings (to the number of six or eight), the outside margins of which are sharpened into knife edges. As a shot passes along the tube and through these rings, the edges of the latter are jammed down upon, and made to cut through, the ends of various insulated wires, one of which is placed under each ring. Each of these wires is connected with an electric battery, and, as one wire after another is cut through and the insulation removed, an electric current passes, and a number of electric sparks follow one after another, according to the number of rings and wires. The recording of signals is accomplished by means of a series of metal disks, one in connection with each, which are made to revolve at a certain known velocity. The surface of the disks is of polished silver, coated with lampblack. As soon as a wire is cut by the passage of a shot, a spark hops over to the recording disk, removing a little of the lampblack coating, and thus marking the place by leaving a bare minute spot of bright metal. From the relative position of the successive spots on the disks, and the known velocity at which they revolve, a simple calculation determines the velocity of the shot. A shot usually takes from one two-hundredth to one three-hundredth of a second to traverse the whole length of the bore of a large gun, its speed being somewhat slow when passing the rings, and increasing as it approaches the muzzle of the gun. From the extreme delicacy of the instrument, the calculation can be made with precision to a millionth part of a second, and the velocity determined with the greatest accuracy.

Vapor of Mercury.

M. Merget has discovered that by dissolving iridium, palladium, platinum, gold, or silver, in *aqua regia*, a reagent is obtained which is extremely sensitive to mercury, and which will, he believes, prove of great value in the solution of very many practical and theoretic problems. A paper impregnated with such a solution is marked with an indelible black stain immediately it is brought in contact with mercury or mercurial vapor, no matter how small the quantity, or how low the temperature may be. M. Merget also hopes to be able to throw great light upon the problem of a limited or an unlimited atmosphere, which was investigated without success by Wollaston and Faraday. He expects to be able to prove that mercury constantly sends forth a vapor which ascends to the hight of a mile at the rate of 550 feet per second. As a practical result of his research, M. Merget, by means of these test papers, exhibits the presence of mercurial vapor in all the workshops and warehouses where this metal is used or stored. If a workman passes but one hour in such an atmosphere, his clothing, face, hair, and beard become impregnated with mercury. If he but touches one of the prepared papers he testifies to the presence of the mercury by a well defined black mark.

Calefaction.

M. Laborde has made some suggestive experiments on calefaction. He let a thin thread of water pass through the jet from the blowpipe, and he found on examination that the water which had thus passed, through a heat capable of melting almost any metal, was but slightly warmed; in fact, the difference was but three degrees. If a jet is passed through an ordinary flame, the increase in temperature is considerably higher, probably owing to the incandescent particles carried away by the liquid from the smoke. A sheet of water presents similar evidence. If the jet from the blow pipe is directed against it, it is not pierced, nor is there any sensible heating effect. The finger can be brought to within a few millimeters of the flame, and yet there is no sensation to indicate the close proximity of an otherwise so patent source of heat. It is suggested that if, instead of the metallic curtain used in theatres in the case of fire, a sheet of running water were interposed, so as totally or partly to enclose or shut out the fiery element, that would be an improvement upon the systems at present adopted.

The New Stimulant.

Chloral drinking, according to the physicians, is superseding absinthe, opium and alcoholic stimulants among the better classes. An insidious sedative, its use grows more dangerously on the tippler than more actively intoxicating drinks. The manufacture of this drug is the best evidence of the extent of its use. In Europe, its production has become one of the leading chemical industries, and it is sold by the ton. Baron Liebig affirms that one German chemist manufactures and sells half a ton a week. The London *Spectator* says: "Taking chloral is the new and popular vice, particularly among women, and is doing at least as much harm as alcohol. The drug is kept in thousands of dressing cases, and those who begin its use often grow so addicted to it that they pass their lives in a sort of contented stupefaction. Chloral drunkards will soon be an admitted variety of the species."

Brown's Water Conductors.

An invention, which has for its object to furnish a strong and durable conductor for water and other fluids, has recently been patented, through the Scientific American Patent Agency, by Mr. John W. Brown, of Milton, Vt. An exterior trough and an interior pipe are made of burned or hardened clay or cement laid in the ground, the flat bottom of the trough resting on the bottom of the ditch. The water pipe is entirely surrounded with cement, interposed between the trough and pipe, so that the joints of the pipe as well as of the trough are covered and filled. The parts being thus joined together form a solid and compact mass, which is claimed to be capable of resisting great pressure, the joints remaining perfectly tight. The cement, owing to the moisture in the earth, will harden to the consistency of stone. The inventor does not confine himself to any particular form or size of the pipe or trough, nor to any particular ingredients in their composition, nor to any particular kind of cement, but proposes to use hydraulic cement. The trough may be made to receive branch pipe of any angle, and is adapted to all situations where earthen or cement pipe can be used.

Pollock's Apparatus for Drying White Lead and other Pulpy Materials.

Heretofore these substances have been dried by one of the following processes: First, upon large stationary pans, upon which they had to be placed and spread on by hand and removed in the same manner. Second, in small earthen pots placed upon shelves in a room kept hot by stoves. Third, in kilns, upon tables of tile with heating flues underneath; or upon stationary tables with steam heat applied underneath. But all these plans are very slow, besides involving expensive handling; and when done, the stuff is in hard cakes, which have to be broken up to feed the grinding apparatus.

By the use of this new automatic feed apparatus, in combination with a rotary table, the expense of applying the stuff to be dried to the dryer by hand is saved. By the use of a rotary drying apparatus the substances are dried while continuously passing along from the stock cistern to the mixing tub; and by the application of heat, to the upper side as well as the lower side, the work is not only done much quicker, but the stuff does not cake, being delivered in a pulverized condition, which is attributed to the disturbance of the particles by the water, which is so rapidly expelled when passing under the rollers as to be boiled or converted into steam which, in escaping, prevents the adhering of the particles.

Mr. James B. Pollock, of Port Richmond, N. Y., has recently patented this apparatus through the Scientific American Patent Agency.

New Process of Sugar Manufacture.

There are at present on view at the offices of Mr. Henry T. Chamberlain, sugar and colonial broker, Clare street, Bristol, a number of samples of Demerara sugars which have been manufactured on the island by an entirely new process. The samples are of precisely the same description as were exhibited at the Georgetown Exhibition, Demerara, the special quality of the sugars being that they are prepared without the aid of animal charcoal. Instead of that material being used, bichromate of lime is substituted, and produces, from the raw cane juices, sugars which are not only unusually strong, but which are highly crystallised, and have an elegant appearance. Mr. Chamberlain states that, although the sugars are not known in this country, considerable quantities of them have been sold in America, and have there met with much favor. The samples, which are about a dozen in number, vary considerably in appearance and quality. Some of the crystals are very large and round, and would, probably hardly suit the English taste; others are white and sparkling; while some have a bright yellow color and are really handsome sugars. It is believed that the employment of the bichromate of lime instead of animal charcoal makes a difference in the cost of manufacture of about 2*l*. per tun.—*London Grocer.*

EDITORIAL SUMMARY.

IRON AND STEEL BOILER PLATES.—Referring to the use of steel for boiler plates, tubes, etc., Herr Kretschmer says that before experience could be gained on this subject, it would be necessary to have a brisker demand for the article than hitherto had been known. The employment of steel in this direction is but in embryo, but he considers that there is not much to be said in favor of the replacement of iron by steel for plates. At the Remscheid cast steel works, an explosion occurred under the following circumstances: About five pounds of molten steel were poured into a cast iron vessel filled with water; this vessel was shivered to pieces. One man was seriously injured by some of the flying fragments. The detonation was considerable. It is supposed that the explosion was caused by the generation of oxyhydrogen gas, and not by a sudden formation of steam.

CURIOUS EXPERIMENT.—Mr. Kroening points out the following mode of determining which of two objects seen from a distance is further off than the other: Let the reader suppose two trees, for instance, standing in a line with the eye; if he moves his eye to the right, the tree which is nearer will appear to move to the left, and the other will seem to follow the motion of the eye.

THE great man is he who chooses the right with invincible resolution, who resists the sorest temptations from without and within, who bears the heaviest burdens cheerfully who is calmest in storms and most fearless under menaces, and whose reliance on truth, virtue, and God is most unfaltering.

PRESERVE your conscience always soft and sensitive. If but one sin force its way into that tender part of the soul, and is suffered to dwell there, the road is paved for a thousand iniquities.

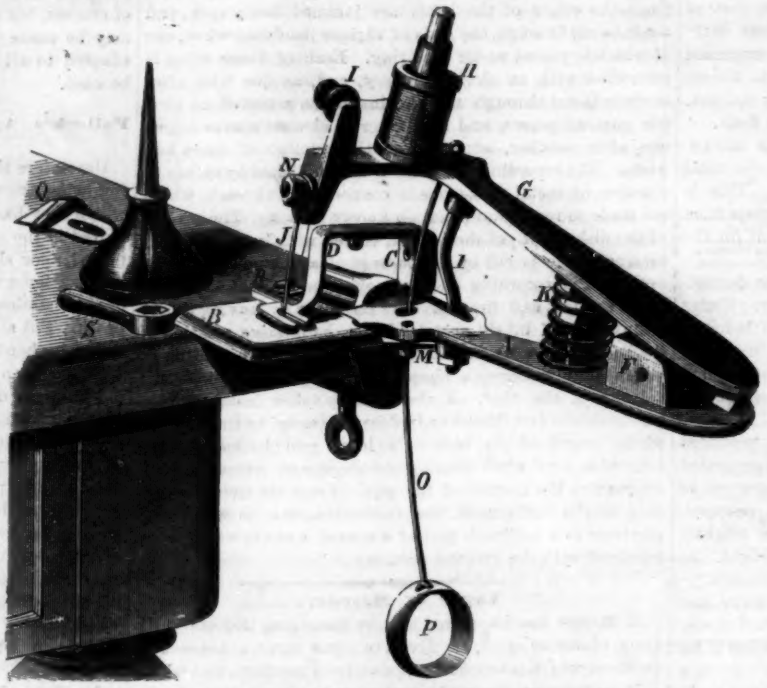
The Beckwith Sewing Machine.

To make a very cheap sewing machine has been the aim of many inventors. To make a very cheap and also a good one has been sought by some, but few have been successful in combining the two advantages of small cost and great utility. We, however, exhibit in the accompanying engraving one that possesses the utility of more costly machines, while it is furnished at a price below anything we have seen of the kind that can perform the same work in as complete a manner. It is capable, as we have proved by operating it, of doing plain seaming, hemming, tucking, stitching, embroidering, and, in short, most of the sewing done in families.

The stitch is the elastic loop stich, which has, against many misrepresentations and much prejudice, gained a wide popularity, many now preferring it to the lock stitch. In fact, a high priced machine, which has had probably as large, if not larger, sale than any other in England, employs this stitch. The machine under consideration fastens off the seam in such a way as to make the work strong and elastic, so that it stands well in washing, and possesses the elasticity, strength, and other advantages which undoubtedly belong to the loop stitch.

The parts of the machine are so few, and its adjustment are so simple, that skill to run it may be acquired almost at one sitting.

The portability of the machine is an advantage which will lead to its purchase even by those who own larger machines, as it can be carried to any part of the house; or, when its owner wishes to spend the afternoon or evening away from home, it can be taken along as easily as a needle case, or carried in a trunk, valise, or satchel, on a journey. The box in which the machine is packed is, in its greatest length, only six and a half inches, and is four inches in hight. It holds not only the machine but the wrench, thread, oil can, bottle of oil, hemmer, different sized needles, etc., which accompany it.



THE BECKWITH SEWING MACHINE.

The fatigue of operating it is much less than that of larger machines, so that children and ladies, in too feeble health to use the latter, may employ this without injury. An easy speed for this machine is 240 stitches per minute, as we have found on actual trial. A little practice would enable this speed to be much exceeded, while it may be run as slow as desired.

The machine is nickel plated throughout, so that it will not tarnish with handling. It is substantial and durable, and the appliances shown in the engraving accompany each machine.

Referring to the engraving, the parts of the machine and their uses are as follows:

A is an L shaped bar that supports all the other parts of the machine; B is the cloth plate. From the bar, A, rises a stud, C, to which the presser foot, D, is attached. The end of the bar, A, next the table, slips through a slot in the clamp, E, which fastens the machine to the edge of an ordinary table or stand, as shown. To the bar, A, is pivoted, at F, the bar G, which carries the spool, H, the tension, I, and the needle, J. When not at work, the bars, A and G, are kept asunder by the action of the coiled spring, K, which surrounds two studs on A, between which plays a stud, on G, by which lateral strain on the pivot, F, is avoided, and the vertically vibrating bar, G, is guided in its movement. From the under side of the bar, G, extends downward the bent bar, L, the inclined part of which plays in a crotch formed in the rear end of the hook, M, thus actuating the latter, which is pivoted to the bottom of the bar, A. The needle is held by the nut, N.

The machine is operated by a strong and tough piece of wire, O (best piano wire) extending from the bar, G, down through a hole in the bar, A, and having a thumb ring, P, at its lower end.

Q is the hemmer, lying loose on the table. R is the guide attached to the plate, and S is the wrench which turns the nut, N.

The needle has its eye, which receives the thread, in the point; and when the bar, G, is drawn downward, it is forced down through the fabric, forming a loop which is entered and held by the looper hook, M, till the needle is raised and forced down again, when the hook releases the loop previously caught, and engages the new loop, and so on.

The feed motion is accomplished by the needle itself, which is set inclined, so that in its descent it draws along fabric enough to gain space for the next stitch. It is obvious that the setting of the needle will govern the fineness of the stitching. The cloth is fed towards the operator, and passes into the lap from the machine, the table to which the machine is attached forming a support for the work, so that it is easily guided by the left hand. The thumb of the right hand is placed in the thumb ring, P, in operating, and depresses the bar, G, causing the needle to penetrate the cloth, and the other parts of the machine to act in conjunction with it. The spring, K, makes the upward stroke.

In conclusion, we will say that a large number of testimonials have been shown us, certifying in enthusiastic terms to the satisfaction the machine has given those who have used it. A large numberhave been sold, and the demand for them is said to be rapidly increasing. It was patented, in the United States, April 18, 1871. Foreign patents have been secured. For further particulars address W. S. Barlow, President Beckwith Sewing Machine Co., 26 West Broadway, New York.

PIG IRON.—Mr. C. R. P., of Milburn, Ky., writes to say that a hog of his died suddenly, and in the intestines were exhibited, by the autopsy, a quantity of nails and screws, besides pieces of copper and tin plate. [It is well known that swine will attack anything when hungry; and, in places where food is scarce or dear, they have been known to swallow pebbles or lumps of clay. They can be restrained from this pernicious practice by keeping the trough full of corn; and, on the other hand, they can be compelled to support animation on anything that lies round, if the supply of the proper sustenance be cut off.—ED.

BALDWIN'S SAW CLAMP.

Some one has said, "simplicity is the soul of beauty." Be this as it may, there is no doubt that simplicity in all articles of common use, is an element of popularity that cannot be dispensed with.

Fig. 1

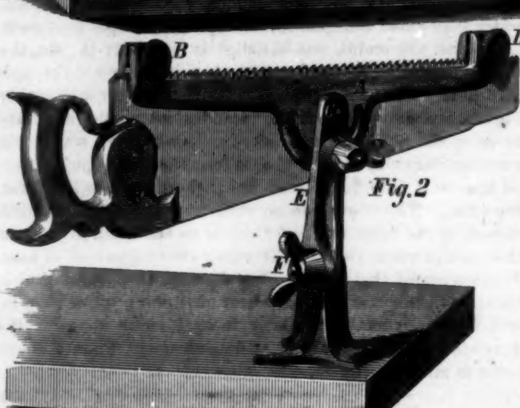
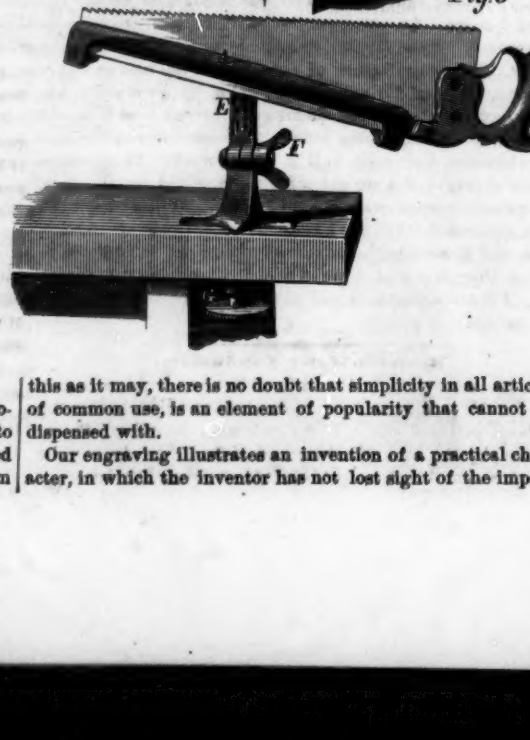


Fig. 3



Our engraving illustrates an invention of a practical character, in which the inventor has not lost sight of the importance of simplicity. The invention consists in a clamping device for holding saws in the processes of filing and setting, the utility of which will at once impress itself on the minds of practical mechanics.

Fig. 1 shows the implement folded and lying on the top of a neat packing case. Front and rear views of the invention, as it appears in use, are shown in Figs. 2 and 3.

A are the jaws in which the saws are held. They are brought together by the screws, B, Fig. 2. The jaws acting together are pivoted at C, a thumb nut, D, the screw of which passes through a semicircular slot in the jaws, enabling the latter to be set and held at any angle with the upright, E, that supports the jaws. The upright, E, is pivoted to the pedestal at F, the pedestal being socketed to fit the square end of a support, G, inserted through the bench from the bottom. By means of the pivots, C and F, and the thumb nuts, the saw may be held in the most convenient position for filing, no matter what the shape of the blade may be.

In Fig. 3, the jaws are shown rotated about the pivot, C, and reversed for holding the saw while jointing the teeth. This is done by taking out the screw at D. When the jaws are thus reversed, they are held by a simple device not shown in the engraving.

The implement is an exceedingly handy appliance, and will take up but little room in the tool chest. Although the patent has been so recently issued, the inventor states he has received quite a number of orders.

The invention was patented through the Scientific American Patent Agency, Dec. 26, 1871, by Nathan H. Baldwin, of Laconia, N. H. The inventor wishes to dispose of the entire right, or any portion of territory.

NEW MATERIAL FOR CRUCIBLES.—At Wocheina, in Krain, a substance has recently been found which promises to become of considerable importance in the manufacture of crucibles, etc., for cast steel works. It is called Wocheinit, after the place where it was found, and its chief recommendation lies in its large percentage (50·82) of alumina. Richter has demonstrated that the resistence of crucibles to the influence of heat depends largely on the amount of alumina contained in the fireclay. By itself the Wocheinit may not prove plastic enough for molding, but Dr. H. Schwarz says that two parts of Wocheinit with one or two parts of ordinary fireclay gave the best results.

THE FRANKLIN STATUE IN PRINTING HOUSE SQUARE.

The birthday of Benjamin Franklin was celebrated on the 17th January, by the unveiling of a fine bronze statue of that eminent printer, statesman and philosopher, executed by Mr. Ernst Plassman, and presented to the Press of New York city by Captain De Groot. An appropriate site in Printing House Square had been selected, upon which a handsome pedestal of granite had for some days supported the veiled statue. When the banner was removed, general satisfaction was expressed in regard to the artistic merit of the work. The ceremonies were conducted by distinguished clergymen and members of the Press, and in the evening a banquet was held at Delmonico's, with the usual accompaniment of speeches and toasts.

Reward for Electrical Improvements.

By a decree, dated April 18, 1866, of the Minister of Public Instruction in France, a prize of 50,000 francs ($10,000) was offered for the most useful application of the voltaic pile, the period for competition to expire in April, 1871. From a report of the minutes presented by the President of the Republic it appears that candidates are few in number, and that, in the opinion of the *savans* to whom the memoirs were submitted, none is of sufficient merit to have earned the prize. By a decree of the 29th of November, the competition is now extended for another period of five years, to terminate on November 29, 1876.

Chinese Astronomy.

Professor John Williams, of the Royal Astronomical Society, England, has lately published a book of "Observations on Comets, from B. C. 611 to A. D. 1640," being extracts from Chinese annals. The introductory remarks contain a brief summary of the progress of astronomy among the Chinese, together with many particulars of interest relating to that subject, among which the instructions of the Emperor Yaou to his astronomers, extracted from the "Shooking," one of the most ancient of the Chinese records, are the most deserving of notice, being, perhaps, the earliest example of astronomical direction that has descended to us, dating, on the authority of the work just mentioned, the "Shooking" about 2,300 years before the Christian era.

THE manner of giving has been said to show the character of the giver more than the gift itself; yet the character of the gift may often be of even more significance than the manner of giving. It is not the value of gifts in money that renders them precious to any but mercenary hearts.

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Contents:

(Illustrated articles are marked with an asterisk.)

HEATING AND VENTILATION OF BUILDINGS.

The great mistake made in many systems of heating and ventilation is the attempt to perform two things together that should always be done separately. To heat a room is one thing, to ventilate it is another. These things should be kept independent of each other, and means of controlling each without interference with the other should be provided.

For example, in heating a room with hot air, as much cold air must issue from the room as there is hot air admitted. The amount of ventilation is therefore proportioned to the amount of heating. Now it is often necessary that a room, a church, or school room, for instance, should be heated in advance of its occupation, when there is no occasion whatever to ventilate it, and all the heat which passes out of it and is not brought back after it has reached the proper temperature, before the gathering of the assembly, is waste, pure and simple. Yet to warm the cold walls and benches, a constant stream of hot air is admitted, which, losing only a small modicum of its original heat, rushes out again into the open air in most instances, instead of being conveyed back to the furnace to be reheated, as it ought to be to secure economy. If means to do this are provided, and the proper adjustment is made, ten to one that the janitor or sexton will neglect to unmake it when the people come together, and they will breathe over and over the same air till it gets completely charged with narcotic poison.

We avow that we have never seen satisfactory ventilation in a building where the system was not independent of the heating apparatus. We do not mean by this that the tendency of cold air to gravitate, and of warm air to levitate, may not be taken advantage of in ventilating, but that the apparatus which heats shall in no way be employed as a means to regulate the outflow of air. If the latter be the case, depend upon it there will be either overheating and under ventilation, or over ventilation and underheating.

As our readers are aware from previous discussions of this subject, we do not regard hot air furnaces favorably in a sanitary point of view. Radiant heat, uniformly diffused, for us. No artificial sirocco, loaded with burned dust particles, and dried till it parches throat, lungs and skin. Yet even this method could be made tolerable, could men of sense be entrusted with the construction and erection of air flues and furnaces, so that (after all) what we complain of is more due to ignorance of the laws of heat than to the system *per se*. It is because through general ignorance faults are so liable to be admitted into the system, that it does not find favor in our eyes.

There is also reason to suspect the cast iron stove of insidiously undermining health. Cast iron is so porous that even water may be forced through the finest varieties of it, under pressure. The coarser varieties are permeable to some light hydrocarbon liquids, without pressure. Gases under the action of heat pass through this material, as has been proved by actual experiment, one product of combustion often thus escaping to such a degree as to cause lassitude, mental depression and headache. Some physicians maintain that the effect of this gas is cumulative, and leads to typhoid fever and other sanitary evils.

How then shall we heat buildings? All large buildings may be heated by steam, but dwellings are often too small to apply this system economically with any steam heating apparatus of which we are at present cognizant. A field is now open for the introduction of a very cheap and economically working steam heater, could such a one be invented.

Without adopting the expensive porcelain stoves employed in some parts of Europe, it is possible a remedy may be found in some method of rendering hot cast iron impermeable to gases. A cheap, simple method for doing this would be a valuable improvement.

How about wrought iron stoves? Wrought iron is impermeable to gases, and there are facilities now for working iron plate by which stoves could be made, if not so cheap at the outset, yet still, we believe, far better to use, and more durable in wear. Here is another field for inventive thought, which we are confident it will be profitable to explore.

THE ANTIQUITY OF THE IRON MANUFACTURE.

Iron, the most common, as well as the most useful of metals, is undoubtedly the most ancient. Tubal Cain, the half brother of the patriarch Noah, is stated to have been the original "instructor of every artificer in brass and iron;" and though we cannot even conjecture what the primeval "brass" was, we know that iron was then as now the most universally diffused of all metals; although it must be admitted that, from the days of Tubal Cain to those of Henry Bessemer, the manufacture has made considerable strides.

Chalybia, on the shores of the Black sea, furnished the ores of the most ancient European iron of which we have any record; and the Arundel marbles give distinct evidence that its use was known at least two centuries before the supposed period of the Trojan war (about 1400 years B. C.) It is mentioned by Homer, in the Iliad and elsewhere; but his descriptions, and those of Thrasyllus and other ancient writers, all point out that it was wrought iron that was used; and probably this iron was made by welding together some highly ferruginous ores at a red heat. Thus weapons and blades could be easily fabricated without the use of any smelting process. The Chalybes also gave their name to steel (Chalybs), called by the Romans "white iron;" and four distinct qualities of steel were known to the Greeks. The hardening of steel by plunging into water was certainly familiar to the most ancient inhabitants of Greece, for Homer speaks of "hissing, as water hisses when the smith immerses in it a piece of red hot iron, in order to harden it." And case hardening by carbon was also done by the same people, "the finer articles being plunged into oil instead of into water." But while the pedigree of the iron manufacture is thus carried back into the most remote periods of European history, we have historical evidence and still-existing monuments, of much greater antiquity, of iron working by the Egyptians and the ancient races of Hindostan and China; and it is among these only that we have any proof of the knowledge, by the ancients, of a casting in iron. Wilkinson, the renowned Egyptian explorer, states that in the monuments in Thebes and Memphis, butchers are represented, sharpening their knives on a round bar of metal attached to their aprons, and these irons, from their "blue color, must have been of steel." More convincing evidence is afforded by the sickle blade, discovered by the Italian traveller Belzoni, under a granite sphinx at Karnak, as well as by a veritable cross cut saw, found by Mr. Layard at Nimroud, now in the British Museum. These facts certainly show that iron manufacture, involving the application of considerable knowledge and skill, is at least four thousand years old; and, beyond even this, we have evidence that this, like most other of the useful arts, came from the extreme east, and is, in India, of still greater antiquity. In corroboration of this view, we quote from the *Engineer* the following paragraph:

"It is strange that of the iron metallurgy of Asia, the mother land of all the arts, of India the country where, more than twenty centuries ago, King Porus presented to Alexander the Great a wrought bar of Damascene steel, just as Homer's Achilles offered for a prize at the funeral games of Patroclus a like valued mass, whence the Greeks obtained the like material for their 'wonder working sword blades,' where steel dies were employed for coinage when our own ancestors were naked savages, less is known than of the iron working of any other parts of the more or less civilized world."

But carrying our investigation farther back into time, and farther east on the map, we find that, among our slight knowledge of the history of manufactures and technical arts of the vast empire of China, the casting of iron is not only of immense age in that country, but has been carried on with great ingenuity and by processes which our knowledge is unable to account for. The authority quoted above mentions "China, whence cast iron hollow vessels now reach us, of a combined magnitude and thinness that we have not yet been able to imitate, or even to imagine the process by which they are cast, and razor steel, said to surpass all European steel in temper and durability of edge."

The most noticeable Oriental monument in iron is a pillar within the precincts of a mosque near Delhi, of which our contemporary says:

"This wrought iron pillar is as large as the screw shaft of one of our first class steamships, and a forging of the same size would be deemed a piece of first class work for any one of our great steam hammer forges in Europe, and yet it is *more than a thousand years old, and may be as much as fifteen hundred*. Its form is either that of a conic frustrum or of some curvilinear spindle, giving it a very slight swell towards its mid hight. The capital consists of an elaborate Indian design, the whole of which good observers deem to have been carved by the chisel out of the solid iron. The shaft, to near the present ground level, is beautifully smooth and true, and presents the character of having been "swaged," or, if not, "sledge planished" to its finished form. The lower part, for three or four feet above the present ground and below it, is rough and but carelessly rounded; there appear to be some rather large cavities in this part of the shaft. The pillar has been known to Europeans for many years. The earliest printed notice of it which the writer has seen is in the 'Journal of the Asiatic Society of Bengal,' Vol. VII., being part of a memoir 'On Lithographs and Translations of Inscriptions,' taken in ectype by Captain T. S. Burt, Engineer.

'The dimensions of the pillar may be approximated from paint marks in a vertical line placed upon it at distances of twelve inches apart, which have transferred themselves to the photograph and been copied in the engraving. The total hight above ground is 22 feet, that of the capital 3½ feet, and that of the rough part near the ground the same. But its depth under ground is considerably greater than its hight above ground, as a recent excavation was carried down to 26 feet without reaching the foundation on which the pillar rests. The whole length of the iron pillar is, therefore, upwards of 48 feet, but how much more is not known, although it must be considerable, as the pillar is said not to be loosened by the excavations. I think, therefore, it is highly probable that the whole length is not less than 60 feet. The lower diameter of the shaft is 16·4 inches, and the upper diameter is 11·05 inches, the diminution being 0·29 inch per foot. The pillar contains about eighty cubic feet of metal, and weighs upwards of 17 tons.

"The principal inscription on the Delhi iron pillar is in Sanscrit, the character that form of Nagari which has been assigned to the third or fourth century of the Christian era. . . . . . The curves of the letters are squared off, perhaps on account of their having been *punched* upon the surface of the iron shaft with a short *cheni* (punch) of steel and a hammer, as the actual engraving of them would have been a work of considerable labor. The inscription itself is of the most disappointing sort—its purport is merely to record that a prince, whom nobody ever heard of before, of the name of Dhava, erected it in commemoration of his victorious prowess; that he was of the Vaishnair (Hindoo) faith, occupied the throne he had acquired (at Hastinapura?) for many years, and seems to have died before the monument was completed; as no royal ancestry is mentioned, he was probably a usurper."

Such is a short account of a most noticeable instance of the truth of our opening remarks as to the universality of the knowledge of the qualities of iron among the earliest peoples of the earth; and once more do we acknowledge the truth of Solomon's saying: The thing that hath been, it is that which shall be, and that which is done, is that which shall be done; and there is nothing new under the sun.

WHAT TO DO WHEN YOU ARE IN TROUBLE.

Don't try to quench your sorrow in rum or narcotics. If you begin this, you must keep right on with it till it leads you to ruin; or, if you pause, you must add physical pain and the consciousness of degradation to the sorrow you seek to escape. Of all wretched men, his condition is the most pitiful who, having sought to drown his grief in drink, awakes from his debauch with shattered nerves, aching head, and depressed mind, to face the same trouble again. That which was at first painful to contemplate will, after drink, seem unbearable. Ten to one the fatal drink will be again and again sought, till its victim sinks a hopeless, pitiful wreck.

Work is your true remedy. If misfortune hits you hard, hit you something else hard; pitch into something with a will. There's nothing like good, solid, absorbing, exhausting work to cure trouble. If you have met with losses, you don't want to lie awake thinking about them. You want sweet, calm, sound sleep, and to eat your dinner with appetite. But you can't unless you work. If you say you don't feel like work, and go a loafing all day to tell to Tom, Dick, and Harry the story of your woes, you'll lie awake and keep your wife awake by your tossings, spoil her temper and your own breakfast the next morning, and begin tomorrow feeling ten times worse than you do to-day.

There are some great troubles that only time heals, and perhaps some that can never be healed at all; but all can be helped by the great panacea, work. Try it, you who are afflicted. It is not a patent medicine. It has proved its efficacy since first Adam and Eve left behind them with weeping their beautiful Eden. It is an official remedy. All good physicians in regular standing prescribe it in cases of mental and moral disease. It operates kindly and well, leaving no disagreeable *sequellæ*, and we assure you that we have taken a large quantity of it with the most beneficial effects. It will cure more complaints than any nostrum in the *materia medica*, and comes nearer to being a "cure-all" than any drug or compound of drugs in the market. And it will not sicken you if you do not take it sugar coated.

A LARGE mass of error is easily embalmed and perpetuated by a little truth.

POLISHING WOOD.

Having had numerous inquiries respecting polishing wood, we propose now to give some plain and simple directions, which, if followed, cannot fail to secure a good result. In doing this, we shall not attempt to give all the ways by which wood is given a fine polish, to do which would extend the article beyond the proper limits; but we will endeavor to give a method which is applicable to nearly all kinds of wood used for purposes in which a fine polish is desirable.

For general use, on hard or soft woods, there is nothing that, in the writer's experience, has proved so good as shellac dissolved in the proportion of four ounces of the gum to one and one fourth pounds, apothecaries' weight, of 95 per cent alcohol. Some have recommended the addition of gum sandarach, in the proportion of about one half an ounce to the above solution of shellac, but we have never been convinced that it was any benefit. It is certain that it renders the polish less hard and durable, and, though it facilitates the work a little, had better, we think, be omitted.

A second preparation, to be used in finishing, will be given below.

If shellac, free from gritty impurities, cannot be obtained, it should be purified by dissolving it in alcohol to a thin solution, and filtering it through porous paper. To obtain a fine polish, the wood must have as perfect a surface as it is possible to give it by tools. The finest sand paper obtainable should be employed. Some use old sand paper, that was coarse when new, to which we decidedly object, as it is likely to have somewhere some coarse grains still adhering, which will make unsightly scratches.

In sand papering, use a light hand and work in all directions of the grain till the wood assumes a soft, velvety fineness of surface, uniform throughout. If you have an old silk handkerchief, it is the best thing to wipe off the dust caused by sand papering. In any case, the cloth used for this purpose must be very soft, and should be warmed, on the same principle that a hatter warms his silk cloth by which he lays the nap on a silk hat after pressing.

Have at hand a little *raw* linseed oil in a saucer. Take a piece of linen and tie up in it a wad of soft cotton wool to make a rubber. The size of the rubber should be proportioned to the work in hand; say from the size of a hickory nut up to that of a hen's egg. The cotton must be compressed in the linen, so as to form a soft, somewhat elastic ball.

To the rubber is applied the polish, taking care to avoid overdosing. Then another linen rag is to be drawn over the ball, and puckered together to form a convenient handle. Now touch the outer rag with a drop of the raw oil from the saucer, and you are ready to begin the rubbing.

Now again use a light hand, especially if the wood has a soft texture. Rub in circles over a limited portion of the surface to be polished. When it is desired to squeeze out more polish, stop the rubbing, and press more heavily, till the polish oozes out through the outer cloth. Then proceed with the polishing till the cloth gets so dry as to risk marring the surface by scratches.

Thus cover the entire surface, putting from time to time more polish between the pad and the outer cloth, and renewing the latter, if necessary. Let the work dry thoroughly, and then put on a second coat of the polish, and let the work stand a day to allow perfect drying and absorption of the polish. When you return to it you will find, if the work was properly done, the entire surface of a dull but nearly uniform luster. A damp cold atmosphere, with plenty of dust floating in the air, are certain conditions of failure; avoid them.

Put on the third coat, and follow it by a gentle rubbing with a soft, clean rag, merely dampened with alcohol. The work is now ready to be finished.

The finishing coat should be given with one fourth an ounce each of purified shellac and gum benzoin dissolved in one and one fourth pounds of 95 per cent alcohol.

The rubber for applying this coat should be new and clean, and the finishing coat should not be applied till the third coat is perfectly dry. You may find that, after all your care, there are some dull spots. You may use "elbow grease" to remove them, as this last coat will bear much harder rubbing than any of the others.

Some practice filling the pores of open woods with glue sizing, but this never gives so fine a result, although it sometimes saves much labor. If a glue size is used, it should be made thin and of the best white glue. It should be well rubbed into the wood with a stiff brush, and after sand papering and dusting, a second coat should be applied. But in polishing wood, as in other nice operations, no good, satisfactory result can be obtained without labor and painstaking. These and a little practice, combined with the knowledge we have attempted to impart, ought to give skill in making what is, in our opinion, the most beautiful finish that can be imparted to wood.

THE SPREAD OF SMALL POX.

The accounts which reach us, in reference to the general spread of this alarming disease in both hemispheres, are calculated to frighten the timid, and to arouse the attention of those who, having little personal dread of the complaint, still feel a philanthropic regard for the welfare of mankind. Of all the fearful diseases that scourge the human race, this ranks among those that are justly feared most. The disfigurating scars it leaves, upon many of those who escape death, are a life long sequel to a most disgusting and painful sickness. The fear of contagion banishes the unfortunate sufferer from home and friends, and consigns him to the care of paid nurses hardened by long familiarity with suffering, and thus adds to the distress which at best attends the complaint.

It would be strange did not some exaggeration creep into the statements of the progress of small pox which reach us from every direction, but there is no doubt an unusual prevalence of the disease both in England and America. So far as can be gathered, it is not remarkably malignant in type, and the average of deaths from it is not greater than is common. It cannot, however, be predicted that it will not assume at any time the form of a malignant epidemic, and its continuance gives ground for the fear that it may become so.

In view of these facts, it is pertinent to inquire whether the periodical spread of small pox cannot be prevented. Facts and statistics fortunately enable a definite answer to be given. In Prussia, where the law requires revaccination to be performed every seven years, death by small pox is of very rare occurrence. Watson's "Practice of Medicine" gives statistics upon this point that will convince any who doubt. Statistics further show that about one half, of those who have had the vaccine disease as a result of vaccination, are liable to a modified form of small pox called varioloid, approaching more or less in violence to malignant types of the disease. The fact is thus fully established that the protection afforded by successful vaccination varies in time with different cases, and that the liability to varioloid is greatest between the ages of 15 and 25 years. To insure safety from the disease, it is necessary that revaccination should be practised not only between the ages specified but even before and after the period included in those limits. It is also a matter of fact that a first or second revaccination may fail and a third impart the disease, though the periods between the introductions of the virus be very short. A case of this kind has recently occurred with a student of medicine at Bellevue Hospital, who only succeeded in producing a true vaccine pustule at the third attempt, the time elapsing between each trial being only long enough to determine that the preceding one had failed.

We think there is no fact better established in medical science than that persistent revaccination will practically exterminate small pox. Had we a law compelling vaccination and revaccination, and could its enforcement be insured, we should soon cease to hear of the ravages of a scourge so dreadful. As it is, it is quite doubtful if such a law could be enforced if enacted. The best we can do at present is for the intelligent to protect themselves without law, against the neglect arising from the prejudices of the ignorant; and if, through neglect, the disease is acquired, to treat it in the most rational manner possible. To this end, we throw out some hints for treatment that have been approved by the medical faculty and which may serve as a guide to the patients and nurses.

First, if there has been exposure, there is time for vaccination to be performed, and to develop the vaccine disease before the small pox shall appear, and to modify the latter into the milder type of varioloid. After exposure, the first thing then should be vaccination.

Second, if the disease be acquired, the attendance of a good physician should, if possible, be secured, and the patient encouraged to accept all the necessary treatment. If delirious, he should be carefully watched, to prevent his disfiguring himself by scratching. Itching during the drying up of the pustules is almost completely controlled by a soft ointment of beeswax and sweet oil, with a little tannin, opium, and carbolic acid incorporated, which has, moreover, the advantage of rendering the smell less disagreeable.

The disease is most infectious during the latter stages. It follows that the most thorough cleansing of apartments, clothing, and the disinfection of every contaminated article should follow the death or recovery of a patient.

It has been suggested that glycerin is a far better liquid, with which to dissolve the vaccine matter at the time of vaccination, than water, as it does not dry, and therefore allows the more thorough insertion of the virus into the punctures in the skin. There are facilities now for obtaining pure matter taken direct from heifers kept for the purpose. Physicians, therefore, who use impure virus ought to be held to the strictest legal account for malpractice.

Now let every intelligent reader, instead of trembling lest he shall be attacked by small pox, take the only known means of prevention, cease his apprehension, and the disease will be mostly confined to the ignorant and the careless.

THE NATURAL FEATURES OF SOUTH AMERICA--NEW AND INTERESTING DISCOVERIES.

The southern half of our great continent possesses very great natural resources, as well as points of interest to the historian, the geologist, the ethnologist, and other scientists; and these resources are being turned to good account with a rapidity which is limited only by the paucity of population. The immense pasturages afford subsistance to countless herds of cattle, and the raising of stock is so cheap that the export of the hides, horns, and tallow well repays the farmer; coffee is a staple production of very great value, and the sugar production is being largely extended. In mineral productions, South America is exceedingly rich, but it will probably be some centuries before these are all made available for the service of mankind. The superior intelligence of the Anglo-Saxon race and the accumulated capital of the United States and Europe will probably be well occupied in developing the metallic deposits of Missouri, Utah, Nevada, Wisconsin and Minnesota for a long time to come. These interesting facts concerning South America are chiefly known to us through commercial enterprises; but we have now intelligence of some recent travels and investigations which we think deserve mention in our columns.

To an enlightened traveller, with a mind capable of learning the lessons spread before him in the great book of Nature, South America offers one of the most inviting fields for labor and study. The vast *flora* of tropical plants, the gigantic mountains and valleys, and the geological formations, of almost infinite extent and variety, have long been the favorite themes of students and writers of science; and from the early days of Humboldt to the present time, South America has been a rich field for the investigator of natural phenomena, yielding abundant and ample reward for the closest and most diligent study. Of its value in this regard, our greatest *savans* have long been convinced; and many among those who have personally examined the great natural beauties and characteristics, interesting and valuable to lovers of each individual science, have written, for the world's benefit, long and interesting accounts of the sights, discoveries, and peculiarities that abound in that country.

The chief points in the cosmography are the mountains, forests, plains, and rivers, all of which are of a magnitude surpassing those of other lands. Notwithstanding the tropical latitude of the northern portion of South America, the climate is singularly mild and equable, owing chiefly to the continuance of the trade winds. And plants, of prodigious number and variety, attain here a luxuriance of which the inhabitants of other countries can scarcely conceive. Forests, extending over two thirds of the continent, abounding in trees of great hight, covered with flowers of surpassing brilliancy to the very summit, have given South America a title to be considered the natural garden of the world. Humboldt, in speaking of this wonderful luxuriance states that, "individual plants, languishing in hot houses, can give us but a faint idea of the majestic vegetation of the tropical zone." While the trees and flowering shrubs are clothed with such extraordinary beauty, the forests are populated with birds whose plumage outshines that of the winged tribes of any other region, in variety, brilliancy and vividness of color. Many of the most useful animals, moreover, are indigenous to the soil; of these are the alpaca, the vicuña, and the guanaco. The winged insects rival the birds in beauty of color and form. Reptiles, on the other hand, are unusually numerous and noxious, many species of snakes being natives of Brazil. White ants abound, and are so destructive that Humboldt states that he was unable to find any manuscript one hundred years old. And the geological features are no less remarkable. Coal is found at a hight of nearly 15,000 feet above the sea level; and porphyry and others of the primary formations have been similarly upheaved by some vast convulsion of Nature.

There is now in progress a most interesting investigation into the geological and other remarkable phenomena exhibited in South America, especially in the Amazonian valley and the Brazilian empire generally. It is eighteen months since Professor C. F. Hartt, of Cornell University, accompanied by Mr. O. A. Derby as assistant, left our shores in charge of an expedition to the Amazon. His intention was to make a complete investigation into the geological character of the shores of the mighty river, and, possibly, to ascertain the truth of the supposition that the valley through which it flows was originally hollowed out by glacial progression. This theory was originally promulgated by Professor Agassiz, and Professor Hartt now reports that he has discovered evidence of the existence of totally different causes for the formation; and he also describes the whole valley as being full of choice relics of the most ancient races, and of the earliest geological formations. In his long and adventurous journey, Professor Hartt encountered many new features worthy of remark, visiting among others the Sierra of Paranaquara, which is one of the highest of the table-topped hills of the valley of the Amazon. This mountain is entirely composed of beds of clay and sand, deposited horizontally.

One of the most important contributions to ancient history is the fact that Brazil was once populated by a race which has left behind it relics of pottery, and mounds of urns, implements and weapons, and other indications of a *quasi* civilization. Many travellers have penetrated into Brazil and directed especial attention to this subject without arriving at any certain decision; but the point must now be considered settled. The claims of philology have not been neglected by Professor Hartt, he having compiled a grammar and dictionary of the Tupy language, which is spoken by the native tribes of Western Brazil; and he has also been successful in making a collection of the legendary traditions of the Brazilian Indians, some of which are said to bear a marked resemblance to the fables which have long been known to Europeans and Asiatics.

It is intended to give permanent interest and value to Professor Hart's labors by the publishing of a full and elaborately illustrated account of the expedition; and, pending the publication, further tidings from the distinguished traveller will be gratefully received by our people as the expedition progresses.

How to Fasten Rubber to Wood and Metal.

As rubber plates and rings are nowadays used almost exclusively for making connections between steam and other pipes and apparatus, much annoyance is often experienced by the impossibility or imperfection of an air tight connection. This is obviated entirely by employing a cement which fastens alike well to the rubber and to the metal or wood. Such cement is prepared by a solution of shellac in ammonia. This is best made by soaking pulverized gum shellac in ten times its weight of strong ammonia, when a slimy mass is obtained, which in three to four weeks will become liquid, without the use of hot water. This softens the rubber, and becomes, after volatilization of the ammonia, hard and impermeable to gases and fluids.

SCIENTIFIC AND PRACTICAL INFORMATION.

MEERSCHAUM.

This curious mineral is known to chemistry as an hydrated silicate of magnesia. Of the lightness, porosity, and friability of this familiar substance there is scarcely any need to speak. It has been found in Spain, Hungary, and in Asia Minor, but recently large quantities of it have been found in Patagonia. This discovery will probably reduce the price of meerschaum, as the supply has hitherto been limited. The manufacture of meerschaum articles has been for many years carried on in Europe, chiefly in Vienna; and Parisian workmen have recently produced some excellent specimens of carving in this remarkable material.

AMMONIA AS A CURE FOR SNAKE BITES.

We recently called attention to the fact that as many as 8,000 persons die annually, in British India and Burmah, from the effects of snake bites. The Inspector of Police to the Bengal Government now reports that of 939 cases, in which ammonia was freely administered, 702 victims have recovered, and in the cured instances, the remedy was not administered till about 3¼ hours after the attack, on the average. In the fatal cases, the corresponding duration of time was 4¼ hours.

BLACKING.

The lustrous qualities of blacking are frequently derived from ingredients which are most deleterious and destructive to leather. Herr Artus publishes a new formula, and claims several advantages for it, to which we may add its cheapness and accessibility: Three or four pounds vegetable black, 1½ pounds ivory black, 5 pounds molasses, and 5 pounds glycerin, mixed thoroughly together. Six ounces gutta percha, cut in small pieces, are then melted, and when fluid, 20 ounces olive oil are added, and subsequently, 2 ounces stearine. The second mixture, while quite hot, is stirred into the first; and then a further addition of 10 ounces gum Senegal, dissolved in about 3 quarts water, is added. This compound is the stock; for use, it should be diluted with about three times its quantity of warm water.

COPPER AND EPIDEMIC CHOLERA.

Among the many facts which have been observed by the collectors of statistics concerning epidemic visitations, one of the most remarkable is the almost complete immunity from cholera enjoyed by persons dwelling in the vicinity of copper works, or toiling in manufactories where copper or brass are manipulated. The best medical authorities mention it as a fact, that, among more than 30,000 persons thus employed in Paris and other European centers of population, the recent outbreak of cholera was fatal in only sixteen instances. This is the more remarkable when we consider that the salts of copper are all virulent poisons, and would seem to be another instance of the mutual destruction of deleterious influences.

ANTIDOTE TO OPIUM.

In a recent case of accidental poisoning by an overdose of morphia, the administration of 18 drops of Norwood's tincture of green hellebore was followed by a complete cure. The narcotic had obtained such mastery over the unfortunate patient that the pupils of the eyes had contracted, and the jaws had to be forced open to give the medicine, which was mixed with two ounces of brandy. All appearance of poisonous effects had vanished within an hour.

THE NEW YORK COMMISSIONERS OF PHARMACY.

This body has issued a report of its proceedings for the last six months of the past year. Six hundred and sixty-six persons, out of over nine hundred candidates, have been licensed, and of these, less than thirty succeeded in passing the examination at the first trial. Egregious and discreditable failures in chemistry, pharmacy, and toxicology, as well as in "doctor's Latin," characterized the large majority who were turned back by the ordeal. Only three out of over seven hundred applicants could read the simplest Latin sentences; but more than this number were familiar with the jargon of the prescription counter. "To express the idea of 'the same,' the word *ejusdem*," says our informant, "was used; and the Commissioners, with apparent satisfaction at the success of the trap, report the results of this test. One clerk, it is stated, replied that in no store where he had been employed had he ever seen or heard of "infusion of ejusdem." This famous prescription was presented at eighteen drug stores in the most populous part of Broadway, and in each the same answer as the above was returned.

WELDING COPPER.

To unite two pieces of copper by welding has puzzled many mechanics and metallurgists, but we read, in a cotemporary, of its recent successful achievement. A compound of 358 parts phosphate of soda and 124 parts boracic acid is prepared, and is used when the metal is at a dull red heat; the heat is then increased till the metal becomes of a cherry wood ised color, and the latter is at once hammered. A hammer of recommended for this purpose, as the metal is liable to soften at a high heat; and the hammer should be used cautiously. All scale and carbonaceous matter must be removed from the surface of the copper, as the success of the welding depends on the formation of an easily fusible phosphate of copper, which would be reduced to a phosphide by the presence of carbon.

LIQUID SPECTROSCOPES.

The use of transparent liquids, such as bisulphide of carbon, for the manufacture of lenses is making rapid progress on the ground of economy, large pieces of glass, free from flaw and blemish, being difficult to obtain and expensive. Poggendorff's *Annalen* calls attention to possible disturbances of the accuracy of liquid prisms, the lines in the spectrum varying with the temperature. The divergence, owing to changes of heat and cold, of the lines of solid prisms is quite insignificant. A glass prism, heated in the sun and then removed to the shade, was observed to posess an increased refractive power as it cooled, while a bisulphide prism exhibited a reversed result. These facts point out the importance of the use of the thermometer in conjunction with the spectroscope, and also show that there is room for great improvement in the manufacture of glass for optical purposes.

ELECTRICITY AND NERVE FORCE.

Mr. J. St. Clair Gray, of Glasgow University, Scotland, has recently observed the mutual action of sulphur and phosphorus in alkaline solutions, and the idea, that such action might be the source of an electric current, occurred to him. Accordingly he prepared a cell containing caustic potash in solution, and placed in it sticks of phosphorus and sulphur; and he found, half an hour afterwards, that the sulphur remained unaffected, while the phosphorus had settled in an oily mass to the bottom of the alkaline fluid. Phosphoretted hydrogen, spontaneously inflammable, was given off during the first six days; but after this time, the gas became somewhat sulphuretted, and no ignition took place. The test by Sir W. Thomson's electrometer, made by a qualified assistant of that eminent philosopher, showed the electromotive force to be 162, while a Daniell, acting under similar conditions, exhibited 120 only. A remarkable feature of this battery was that the fluid phosphorus on being removed and washed, still retained its liquid state. Sticks of solid phosphorus were introduced, and they not only did not help the liquor to solidify, but speedily became deliquescent themselves.

Mr. Gray's object was to obtain data to support a theory on the origin of nerve force, he being convinced that the power of the nerves has an electric element in it. He was induced to make the experiment described above by the well known facts that phosphorus is largely present in the brain and sulphur in the liver, and that an alkaline fluid is in constant circulation between them. He has tested this theory by experiments on a rabbit, and considers that he is justified in assuming that his explanation of the existence of galvanic action between the brain and liver is correct and well founded. We shall probably soon be enabled to lay further results before our readers.

PORTLAND CEMENT AND IRON FILINGS.

Abbé Moigno, in his valuable scientific journal *Les Mondes*, relates his personal experience with a concrete formed of fine wrought and cast iron filings and Portland cement. The Abbé states that a cement made thus is hard enough to resist any attempts to fracture it. As he states that the iron filings are to replace the sand usually put into the mixture, we presume that the relative quantities are to be similar.

FRENCH TEACHING AND DRAMATIC RECITATIONS.—Professor Favarger is forming a new class for instruction in French, by his peculiar system of Oral Teaching. The opportunity for improvement in French conversation, afforded to those availi ng themselves of Mr. Favarger's instructive lectures and recitations, is obtainable in no other way in this city. The lectures are to be held in Chickering Hall, and his patrons heretofore have been composed of the leading ladies and gentlemen in New York literary society. Mr. Favarger will be happy to communicate with persons wishing to join his classes, at No. 8 East 9th street.

TO CITY SUBSCRIBERS.

The SCIENTIFIC AMERICAN will hereafter be served to our city subscribers, either at their residences or places of business, at $3·50 a year, through the post office by mail carriers. The newsdealers throughout this city, Brooklyn, Jersey City, and Hoboken keep the SCIENTIFIC AMERICAN on sale, and supply subscribers regularly. Many prefer to receive their papers of dealers in their neighborhood. We recommend persons to patronize the local dealers if they wish the SCIENTIFIC AMERICAN or any other paper or magazine.

NEW BOOKS AND PUBLICATIONS.

SCIENCE RECORD FOR 1872. Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50: extra binding, half calf, $2. Munn & Co., Publishers, 37 Park Row, New York, Office of the SCIENTIFIC AMERICAN.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The leading discoveries, facts, and improvements, in chemistry, mechanics, engineering, natural history, and the various arts and sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis tunnel, the Hell Gate works, the Brooklyn suspension bridge, the Hoosac tunnel, the St. Louis bridge, the United States Patent Office, and other works are il ustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library.

LA AMERICA ILUSTRADA (ILLUSTRATED AMERICA).

This is the title of a new and beautiful illustrated semi-monthly paper, in the Spanish language, published by J. C. Rodrigues & Co., Times building, New York. Its illustrations and typography are of the most elegant description; its contents, varied and interesting. All classes of readers will take pleasure in its study. In h s opening address, the editor states that the object of the periodical is to diffuse among the Latin races of America a knowledge of those social and political principles that have elevated the United States to their present position of dignity and splendor. In *La America Ilustrada* our country will have a worthy representative before the Spanish speaking populations of the two great western continents, and we heartily wish for its editors and proprietors the most abundant success.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

The Patent Star Bevel—the best Tool of the kind ever invented. Try one, and you will use no other. G. W. Hallett & Co., West Meriden, Conn.

We want to buy, make on contract or royalty, any practical, newly invented Tool that is of use to mechanics. G. W. Hallett & Co., Proprietors Star Tool Co.'s Works, West Meriden, Conn.

Walrus Leather, for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Parties having Tools or Material for Sale pertaining to a New Machine Shop, will please send Price Lists to F. H. Duncan, Washington, Davis Co., Ind.

Patent Rights Sold by Moody & Co., 7 Murray St., New York.

I. K. For perfect Engine Lathes, 4 ft. Bed, 12 in. Swing, address Wm. E. Cass, 61 Hamilton St., Newark, N. J.

Parallel Hand Vise, lately perfected, with two Cross Bars, Screw and Jaws of solid steel. W. X. Stevens, East Brookfield, Mass.

For Sale—Iron Foundry. Adrss N.L.North, Williamsburg, N.Y.

Wanted—To Contract with responsible parties who have had experience in building sewing machines, to build from one to five hundred of Spencer's Engraving Machines, as represented in the Scientific American, Vol. XXIII., No. 5, 1870. Address Banta & Harris, Geneva, N. Y.

To Machinists: E. & A. Betts, Tool Builders, Wilmington, Del., have for sale, just finished, a very nice Planer, that planes 42 in. square and 16 ft. long, with a 14 in. widening piece; weight, 21,500 lbs.

To Lease—Machine Shop on the Hudson, in perfect working order, suitable for any Machine Work. Iron, Brass, and Steel Castings made on the premises. Van Zandt Bro's, 4 Dey St., New York.

A Correspondent wanted, who understands the erection of works for, and the manufacture of, Malleable Gas Fittings, with the view of an engagement. Address, Lock Box 1821, Titusville, Pa.

A Mechanical Draughtsman wants a situation in a Draughting Office. Good testimonials. L. F. Baker, 20 Union St., Hartford, Conn.

For 2 & 4 Horse Engines, address Twiss Bros., New Haven, Ct.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Blake's Belt Studs. The cheapest and best fastening for Rubber and Leather Belting. Greene, Tweed & Co., 18 Park Place, N. Y.

Edson's Hygrodeik is the best Hygrometer in use. Send for circular. Geo. Raymond, Fitchburg, Mass., Gen'l Agent for United States.

The Improved Ingham or California Cleaner and Smutter Combined is beyond question one of the very best and cheapest in America. Send for illustrated circular, giving full particulars. It will pay you. Address M. Deal & Co., Bucyrus, Ohio, Manufacturers.

Presses, Dies & all can tools. Ferracute Iron Wks, Bridgeton, N.J.

Maine's Portable Ventilator—Adjustable to any window Fresh air without draft. See Scientific American, Dec. 23. Send for Circular. Underhill & Co., 96 Duane Street, New York.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch street, Philadelphia, Pa.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber Mf'g Co., 9 & 11 Park Place, New York.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Williamson's Road Steamer and Steam Plow, with Thomson's Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Hand Fire Engines, address Rumsey & Co., Seneca Falls, N.Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca, Falls, N.Y.

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

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Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

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For Best Galvanized Iron Cornice Machines in the United States, for both straight and circular work, address Calvin Carr & Co., 26 Merwin St., Cleveland, Ohio.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories. Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Photographs.—Rockwood, 845 Broadway, will make 8x10 negative and six photographs of machinery, in any part of the city, for $10.

Power Punching and Shearing Machines. For car builders, smith shops, rail mills, boiler makers, etc. Greenleaf Machine Works, Indianapolis, Ind.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—Fireproof Paint.—Will some one please give me a recipe for a good, durable fireproof paint? And also for a whitewash?—A. L.

2.—French Finish for Leather.—Can any of your correspondents inform me, through your valuable paper, how to make French finish for leather, and how to apply it?—W. L. C.

3.—Scale in Boilers.—I wish to know whether soapstone is known to be a preventive of scale in boilers. I have used it in certain forms, and think I have secured favorable results.—G. M.

4.—Inked Ribbon.—Please inform me how to make carbonized tape or ink ribbon, such as is used in stamping the date on railroad tickets.—E. V. B.

5.—Electro-Deposition on Flowers, etc.—How can I make the surfaces of leaves, flowers, insects and delicate objects, conductors of electricity, so that I can electroplate them with copper, etc?—D. W.

6.—Preparing Glycerin.—Will some of your many readers inform me, through the Scientific American, of the easiest method of preparing glycerin? Also their opinion as to its application as a lubricator?—C. F. E.

7.—Saw Filing.—Will any of your subscribers inform me as to the best way of filing a cut-off hand saw? Some hold the point of the file toward the point of the saw, and others hold the point toward the heel.—C. M. B.

8.—Hardening Cast Steel.—Will some of your readers be kind enough to inform me of the best method to harden good cast steel, to combine toughness with hardness? Something that will stand without snapping or breaking, like a file temper, is required. I have tried a great many ways of hardening cast steel, so as to get something like what they call a diamond hardness, but I have failed to get the article to the desired quality.—D. H.

9.—Concrete Building.—Will some one favor me with some more of the same sort as the article on page 359, Vol. XXV? Would it be as well to mold the concrete into convenient sized blocks first, and then lay them, like brick? What kind of mortar should be used in laying? How thick should the wall of an ordinary two story house be? Will the concrete answer for the cellar walls and foundation? Will it also answer for the chimney? Does it shrink or expand any in hardening?—B. L. V. A.

10.—Steam Heating Boiler.—I heat a factory by steam, having a boiler 8 feet 6 inches in length, and 29 inches in diameter; there are thirty-four two inch tubes in it, and it has a steam dome, 2 feet in hight and 16 inches in diameter. Is this boiler large enough to supply steam for 2,000 feet of heating pipe one inch in diameter; or will the pipes condense the steam faster than the boiler above described can supply it? Would a superheater be an improvement? and if so, how should it be placed to produce the best results? What will prevent the water from rising to the top of the dome, and rushing through the pipe when the cock is full open?—R. G. W.

11.—Concrete Building.—Will some of your readers inform me if I can build a two story cottage of concrete, composed simply of lime and sand? Or will it be necessary to mix with it Portland cement? If so, in what proportion?—T. P.

12.—Refuse Acid.—Can some one inform me of what use or value is a mixture of equal parts of nitric and sulphuric acid in which a small proportion of cotton has been once dipped? I am at present wasting large quantities of this mixture.—C. P.

13.—Tempering Springs.—Will some of the readers of your paper be kind enough to inform me how to put a good temper in locomotive springs, of both cast and spring steel? And also tell me the easiest way to form the leaves.—R. N.

14.—Stove Cement.—Can any of your readers give us a formula for making a good stove cement, such as is used by foundrymen?—B. & Co.

15.—Tinning Sheet Iron.—I wish to know how to tin iron plates, from six to twelve inches by three inches, and one eighth thick.—W. P. P.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

Liquefying Sulphur.—F. C. A. can melt sulphur in an iron pot or dish, as it becomes liquid at a temperature far below a red heat.—J. A. L., of O.

Stamping Letters on Steel.—C. T. can do this by punching with steel punches before the saws, etc., are tempered and polished.—J. A. L., of O.

Heating Steel Articles.—W. S. K. can heat small iron or steel articles in a lead bath heated to redness. A covering of cinders or charcoal dust will prevent the dross from forming.—J. A. L., of O.

Fastening Leather to Iron.—If L. P. will give his pulleys a good coat of white lead paint, let it dry, and then use common glue, he will have no more trouble in making the leather stick.—C. D. A., of N. Y.

Neats' Foot Oil.—M. B. E. can clarify his neats' foot oil by putting shot or scraps of lead in it.—E. O. McC., of S. C.

J. S., of ——.—Your query was answered in the second editorial of our last issue.

G. M., of Ill.—We do not see how a spring attached to a fusible plug in a steam boiler, the design being to pull it upward to insure its release, would be an improvement.

J. S. B., of Ill.—The sample of sheet copper sent would not, in our opinion, sustain a pressure of 125 pounds per square inch in the center of an ordinary locomotive fire box.

Saw Gear.—If E. L., query 14, January 6, 1872, will place his mandrel directly above or below his line shaft, he can drive his saw with quarter twist belt; but his shafts are too close together to give satisfaction. In order to get quarter twist belts to do much good, they should be as long as possible, and work on small diameter pulleys.—J. E. G., of Mo.

Proportions of Cut Off.—Let A. H. G. proportion his valve according to the following table, and he will find it right. He will have to slip the eccentric around on the shaft, in proportion to the amount of lap he wishes to add to the valve. To ascertain the amount of lap necessary on the steam side of a slide valve, to cut off at various fractional parts of the stroke: To cut off at half stroke, multiply the valve stroke by ·354; seven twelfths, ·323; two thirds, ·289; three fourths, ·250; five sixths, ·204; seven eighths, ·177; eleven twelfths, ·144. The product will be the lap of the valve in terms of the stroke.—H. P. R.

Facing Oil Stones.—In your paper of January 1st, R. J. McC. states that he has spent a good deal of time in facing his oil stones, and that emery glued to a board is a good and easy way of doing it. I do not doubt this, but emery is an article not much used in carpenters' shops, and a grindstone is always found there. If R. J. McC., or any other person, will hold his oil stone against the side (not the periphery) of the grindstone, I think he will find it a great deal easier and quicker, if not better than emery, and he will save the trouble and expense of making the board. If the stone is run by steam, he will have to be careful not to press too hard at first. I always use water, as otherwise the stone will become glazed and not cut.—S. C., of Pa.

Heating Iron Articles.—In answer to the query of W. S. H., in your paper of January 6, 1872, in regard to heating small iron articles rapidly and without scale, I would inform him that, if he will use the hot lead bath, he will no doubt find it to answer his purpose. By building a small furnace, and placing therein a cast iron crucible of from four to eight inches or more diameter, and deep according to the depth of his articles, he can heat as many articles at once as he desires; and as fast as he takes one of them from the crucible to stamp, he can return one in its place to heat; and by keeping some four or five articles in the crucible at one time, and working from one to the other, they will keep him going as fast as he likes, and no scale will be produced. I would advise him to keep the surface of the lead covered (to prevent oxidation) with the ashes or small coke from a blacksmith's forge. It will be necessary for him to use hard coal in heating, and to regulate the heat by a damper. I have tried the above process on different kinds of work, and find it to answer.—D. H., of Pa.

Cane Staining.—W. H. is informed that, by the following simple process, the writer has stained canes and similar sticks of a richer brown color than any other he has ever seen: Dissolve a few grains of sulphate of manganese in sufficient water to take it up. Moisten the surface of the cane with this, and hold it over the flame of a small alcohol lamp close enough to scorch it. A little care will enable the operator either to bring the whole surface to a rich brown, or to beautifully variegate it by heating some parts more than others; thus varying the color from white to the deepest black. The color will appear dull at first; but, on oiling it with raw linseed oil and rubbing it with a smooth piece of hard wood, it will be beautifully developed. Give the cane no other finish, unless it be another oiling some days after the first. The writer has not tried this method on white holly; but will be glad if W. H. will give him an opportunity to do so by sending him, in its rough state, a somewhat stout stick of that wood by express, addressed, F. B., Winchester, Va.

H. W. asks for a remedy for a gun that scatters. Sometimes very slow powder will be a remedy. It is a twist in the barrel that makes it scatter. If it was rifled down perfectly straight, I think it would prevent it.—L. C. K., of N. H.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

Arc of a Circle.—W. D. C.
Cast Iron Girders.—W. A.
New Motive Power.—A. S.
Prevention of Boiler Explosions.—C. L.
Psychic Force.—A. V.
To Smoke or not to Smoke.— ——.
Answers to Correspondents.—J. E. G.—B. W.—J. C.—T. McK.—E. N.—E. C. J.—H. L. C.
Queries.—L. S.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Corn Harvester.—John Johnson, Mott Haven, N. Y.—This invention consists in a triangular frame mounted on rollers, with handles at the rear end, a bent finger at the front for running along the ground under the stalks lying thereon and lifting them up to the top, a long cutter on each side, and a finger in communication with each cutter for bringing the stalks up to the cutters. The cutters are fitted in a groove in the side of the side piece of the frame, pivoted to them near the front end, and arranged to swing out and back at the rear end, according to the distance between the rows. They are provided with the curved arms having holes for inserting pins to hold them in any position. They are also provided with a bent finger at the heel, to run along the ground on the opposite side of the row, which is to be received in the angle between the cutter and finger for gathering the stalks into said angle for being cut, two rows at a time, as the machine is drawn between them.

Fruit Jar.—Hassan U. Allen, North Bennington, Vt.—This invention has for its object to furnish an improved square or rectangular fruit can which shall be simple in construction, easily opened and closed, while at the same time it is entirely air tight. It consists in a rectangular body provided with inclined grooves at the top, a cover with a rounded top and with a groove and bead upon its under side, and a clamping strap of a novel design.

Carriage Top Prop Block Washer.—Abraham D. Westbrook, Astorian N. Y., assignor to Fletcher W. Dickerman, New York city.—In manufacturing such articles, it has been found that there is a difference in the length of prop blocks generally, and that, therefore, the making them of definite lengths with flanges proved unprofitable. It has, therefore, been considered advisable to make the prop blocks without flanges, and to cut the material from rubber tubing of suitable length. But although the prop blocks could be made of the proper length required, they were without finished ends, and not as elegant in appearance as the flanged prop blocks. Leather washers have been used, but were not durable, nor as yielding to the varying positions of the bows as is desirable. This invention consists in the introduction of removable rubber washers, that can be applied to the ends of the rubber prop blocks, and securely held in place to constitute a perfect finish.

Butter Tub.—Mr. James Gilbonds, of Jamestown, N. Y., has invented an air tight butter tub, which must prove of value in the keeping of butter sweet during storage and shipping. The basis of the tub is wood, made in a prismatic or any other suitable form, the example given in the patent being square in ground plan, with flaring sides. This basis may be made of staves and head, like the ordinary tub, if preferred. In all cases it is covered with galvanized sheet iron, and has a cover of wood which is also covered with galvanized sheet iron, made so that the metal of the cover overlaps the metal of the body of the tub, and can be soldered thereto, making the package air tight; thus isolating the butter from exterior odors, and deteriorating influences, to which it is subjected in warehouses and during shipment.

TWEERS.—Stephen Parsons, of St. Francisville, Mo.—A tank or water-reservoir, having a tubular projection, is employed, the blast pipe passing through them both. The tubular projection enters the fire and the blast pipe receives the pipe of the bellows or fan blower. Tweers of a construction somewhat similar have been long in use by the public; but they are made up of a number of separate parts jointed together; whereas this tweer is cast in one piece, thereby dispensing with all joints and connections. This not only produces a simpler tweer and one not liable to leak or get out of order, but also one which can be manufactured and sold to the public at a much cheaper rate than those now attainable.

GRINDING MILLS.—John B. Smith, of Bowensburg, Ill.—This invention relates to an improvement in mills for grinding grain. The spindle is hollow down to the bed stone. The hopper has a tubular neck, which enters the tubular portion of the spindle. There are apertures in the spindle, through which the grain which is put into the hopper is discharged between the stones. The flour or meal is discharged by a spout. There is a bushing in the bed stone where the spindle has a bearing. Projections on the spindle enter notches in the lower end of the bush. The runner acts as driver, but the bush is fast in the stone and the spindle is fast in the bush. By constructing the mill in this manner, the inventor is enabled to adjust the hopper by means of a hand wheel, according as the riddle or large hopper from which the grain is delivered to it is adjusted for slow or fast feed. By means of the hand wheel and a sleeve screw, the spindle is held more steadily in place, while a nut serves the purpose of securing the bushing in the eye of the stone and in connection with the lugs or projections on the spindle. The method of feeding the grain through the spindle is claimed to economize space and reduce cost, and no open annular space is left round it in the eye of the stone, as is the case in mills of the ordinary construction.

MODE OF CONSTRUCTING STRAINING LEVER AND BALE TIE FOR PACKING BANDS.—James C. Coit, Cheraw, S. C.—The invention consists in a bale tie and lever tool, by which a single hand may both compress and tie up the contents of a bale without the aid of machinery.

HARVESTER CUTTER.—John A. Bonham and Alvah J. Harrington, Lovely Dale, Ind.—This invention relates to an improvement in harvester cutters, end consists in the peculiar construction of sectional cutters and in the manner of attaching the same to the cutter bar.

MACHINE FOR SHELLING PEANUTS.—Joseph W. Sands and Benjamin F. Walters, Norfolk, Va.—The invention consists in combining certain old instrumentalities in a new manner, so as to form a new, efficient, and practical machine for shelling peanuts.

JEWELRY FASTENINGS.—Robert James Pond, of New York, N. Y., assignor to Hodenpyl, Tunison & Co., of same place.—Gold chains are often loaded to such an extent that the snap must be fully reliable to insure a proper connection of the ends. Bracelets, too, are subject to strain, and generally give way at the snap. This invention consists in making the snap and spring of one continuous piece, which is inclosed within a tube and provided with a knob, whereby a firm connection, and one that will not spontaneously open, is secured.

BALING PRESS.—Jeremiah Randolph, of Huntsville, Tex.—This invention consists in a novel arrangement of levers, connecting bars, and cords, in combination with the follower and windlass, whereby the follower is worked in the downward direction for pressing, and in the opposite direction for elevating it to recharge the press, by the said windlass. The combination evidently forms a press of great power, easily manipulated, and which can be worked by hand, horse, or steam power.

BAIL DREDGE.—Nehemiah A. Williams, of Warwick, R. I.—This invention is claimed to be free from the objections brought against the ordinary scraper dredge, used in dredging for scallops, oysters, etc. A bar or rod bent at the center forms a bail, having a center or eye for the attachment of the draw rope. The arms of the bar separate from each other at an angle, and are made straight. To the ends of the arms of the bar are pivoted the ends of a curved or semicircular knife so that the knife may be flat upon the bottom whether muddy or hard, and whether drawn by a long or short warp—that is to say, at whatever angle the draft may be applied to it. To the rear edge of the semicircular or curved knife is attached a metallic netting, which forms the bottom of the dredge. To the rear and end edges of the metallic netting and other parts of the device are attached the edges of a twine netting. The nettings are constructed and arranged in the ordinary manner. With the rear edges of the nettings is connected a curved wooden bar, which serves to keep the nettings extended, and which also serves (and this is its especial object) as a hand piece for lifting and emptying the dredge into the boat. By this construction the knife will not sink into or gather up the mud in places where the bottom is muddy, and in the case of hard and irregular bottoms it does not strike dead against the irregularities, but glides along them, gathering all the shell fish. The knife does not sink into the mud when the draft stops, but lies upon the surface, which is claimed to be a great advantage, especially in flawy weather. The angular positions of the arms of the bail also part the sea grass and keep it away from the dredge.

SHAWL OR OTHER DRESS PIN.—Henry C. Strong, of Lansing, Iowa.—This invention consists in an improved and cheaper construction of that class of dress pins which have two pins. The object of the arrangement is to increase the capacity of such pins for connecting more than two pieces or plies of goods together. This pin is more particularly intended to fasten bows upon a lady's collar, and, at the same time, fasten the collar to the dress, which is very readily accomplished by using one of the pins or prongs for fastening the collar to the dress, and the other for fastening the bow to the collar. It is also useful in like manner for fastening many other articles of dress.

SPADE BAYONETS.—William Shephard Wetmore, of London, Eng.—The object of this invention is to provide an improved attachment for bayonets adapted for use as a spade in intrenching, and also as a defensive armor or breast plate for the soldier when in battle. These improvements are used, in connection with the blades of the spades, either as defensive armor or for digging or intrenching, the blades, when used as armor, being carried in any convenient manner; and the modes of connecting the handles of the spades to the blades can be varied to an indefinite extent. For enabling the blade of the spade to be used as a shield or mantlet to the soldier lying behind it, a section of the socket of a bayonet is prolonged to a greater length in order that it can be forced into the earth, there being a hole for the soldier to insert his musket through it.

WHEEL CULTIVATORS.—Nathan Earlywine, of Centerville, Iowa, assignor to himself and Charles A. Davis, of St. Louis, Mo.—This invention relates to an improvement in the class of machines designed for use in cultivating cotton, and chiefly distinguished by a combination of rotary choppers, adjustable scrapers, and furrow or track openers. The improvement consists mainly, in the arrangement of a set of cultivators whose V shaped stocks are bolted to a pendent bar of the main frame of the machine, so as to allow of their adjustment vertically. The invention also consists in the arrangement of said cultivators with reference to scrapers, whereby the surface of the ground is first furrowed or pulverized slightly, and then scraped or cleaned off, so as to leave it in the best condition to produce the desired result. It is proposed to use the machine also for cultivating only when the chopper is not required. The chopping apparatus being detached, it is applicable for cultivating corn as well as cotton.

FIFTH WHEELS.—Robert Denham Wilson, of Pittston, Pa.—This invention consists of a front gear or platform for carriages, composed of two D shaped bars of wrought iron, arranged in peculiar shape, calculated, it is claimed, to greatly cheapen the cost of such gear, and provide sufficient strength with less weight than any heretofore made. This gear is all formed of two bars of metal, is very simple, and may be made up of pieces of scrap-iron, of different shapes adapted to form the several parts, welded together.

HOSE COUPLINGS.—Edward S. Kennedy, John Putnam, and Henry Smith of Birmingham, Pa.—This invention consists in improving hose couplings, so that, in attaching a nozzle to the end of a hose, one part of the coupling may be formed as a solid part of the nozzle, or the nozzle may be screwed into the nut of the coupling. The outer surface of the collar is squared off to enable a wrench to hold it from turning while the inner part is being screwed in and out. The outer surface of the nut is also squared off to enable a wrench to take hold of it to screw it on and off. This construction enables a hose to be conveniently mended by any one, should it burst or cut, without its being necessary to take it to a plumber, as must be done with the ordinary construction.

APPARATUS FOR PRODUCING PLANE OR PARALLEL MOVEMENT.—Albert G. Barrett, of Barrett, Kansas.—The improved plane or parallel movement is designed for attachment to the piston rod and pitman of a steam engine, and for use in other places where slides are used, and is so constructed as to greatly diminish the friction while causing the object to move in a straight line. Two sweeps or levers have their lower ends pivoted to the bed of the engine, or to some other suitable support. To the upper ends of the sweeps are pivoted the ends of a bar bent at its middle, so that lines joining its ends and center may form the sides of an isosceles triangle. The arms of this bar may be made straight or curved, and its ends may be connected by a straight or curved bar, if desired. To the center of the bar which is the apex of the isosceles triangle, is pivoted the end of the piston rod, the pitman, or whatever it may be that is required to be carried back and forth in a straight line. The sweeps must be so arranged with respect to each other that the stroke or movement can never carry them outward beyond a vertical line. It is designed to use two sets of these bars, one upon each side of the piston rod. By this construction the friction, it is claimed, will be greatly diminished, the heavy cross head being no longer required.

PLOW CLEANER.—George W. Burr, of East Line, N. Y.—This invention consists in a flat wheel provided with teeth projecting from the circumference at a downward angle and mounted in advance of the throat of the plow on a pivot, so as to revolve in a plane of about forty-five degrees to the surface of the earth, being turned by the contact of the teeth with the solid earth on the land side in such manner that, at the rear side and at the throat, the teeth will come in contact with any straw, grass, weeds, and the like, clogging therein, and thrown them out with the furrow slice. The support of the said wheel is made vertically adjustable, to vary it according to the depth the plow is to run.

TOY PISTOL.—Henry M. Quackenbush, of Herkimer, N. Y.—A barrel and aperture in combination with an air chamber and piston are made to operate, by means of a groove and spring in conjunction with a case, in such a way as to give very efficient action and cheap construction of an air pistol.

APPARATUS FOR CLOSING BARRELS AND CASKS.—Adolph Koegler, of Newark, N. J.—This invention has for its object to provide an apparatus for removing barrel taps, injecting into the barrels suitable liquid or matter, and then reclosing the barrels. In breweries and other places it frequently occurs that the barrels containing fresh or other beer, ale, or beverage, should, after having been closed for a specified term, be reopened and charged with liquids, gases, or "finings," whereby their quality is improved or their character finally determined. This invention consists in the new arrangement of an ingenious apparatus whereby the tap can be forced into the barrels, a connection established between the opened barrels and an injecting pump, and the barrels finally retapped. The device is also constructed with the view of permitting the escape of gases or liquor from the barrels, if desired.

LUBRICATING AXLE FOR VEHICLE.—Jesse S. Eggleston, of Auburn, N. Y.—This invention relates to means for lubricating axles of cars and carriages, revolving journals, and other frictional surfaces. It consists in an oil chamber and plate with a tube and capillary conductor or wick in the stationary frictional surface to be lubricated. The axle or journal being properly secured at the ends of frictional surface, the oil cannot escape or be wasted, and will be constantly circulating in the box and lubricating the axles or journals with the use of a very small quantity of lubricating material.

CAR BRAKE.—Albert A. Weidemeyer, of Williamsburg, N. Y.—This invention has for its object to furnish an improved double clutch brake for attachment to railroad cars, so constructed that the brake may be applied to all the cars of the train from the engine, and either quickly or more slowly as may be desired. The engineer, by throwing parts of a clutch together, and operating a capstan in the direction to draw upon certain rods, can apply the brakes quickly to all the cars of the train. By operating the capstan in the other direction, without throwing the parts of the clutch together, the brakes will be applied more slowly,

APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—Professor William Klinkerfues, of Gottingen, Germany, has just patented, through the Scientific American Patent Agency, a recent improvement upon his well known apparatus for lighting gas by electricity, described at length on page 393, Vol. XXIV of this journal. The invention has for its object to produce the requisite contact of the exciting liquid with the carbon and zinc elements of the battery by increased pressure of the gas flowing to the burner to be lighted, and thus to dispense with the necessity of mechanical action, except in as far as the turning on of the gas is concerned. The apparatus contains one of the elements suspended above and the other dipped into the exciting liquid which surrounds the capped end of the gas supply pipe, so that the gas at all times exerts a certain degree of pressure upon part of the surface of the liquid. When this pressure is properly increased, the liquid is raised to the suspended element, and causes, by contact therewith, a current to be established. The platinum wire held over the burner is thereby catalytically affected and causes the ignition of the gas escaping from the burner.

ADJUSTABLE UMBRELLA HOLDER FOR CARRIAGE.—William C. Doolittle of Marion, Conn.—This invention has for its object to furnish an improved umbrella holder for attachment to the seats of buggies, pony phaetons, or other vehicles, which is simple, inexpensive, and convenient to use, being so constructed that it may be readily adjusted to hold the umbrella inclined at any desired angle.

MACHINE FOR HEADING BOLTS.—Charles E. Hunter, of Hinsdale, N. H.—This machine is designed to improve bolt heading machines so that the corners of the heads shall be filled out sharp, like the heads of hand made bolts, and not left imperfect as machine made bolt heads ordinarily are. A movable nut or bolt head plunger, a cam, a ratchet and a stationary pawl are combined with a movable holder to form a means for gradually advancing the compressing plunger, in order to secure the desirable result above named.

MODE OF COVERING HARNESS MOUNTINGS.—William Fawcett, of New York city.—This invention has for its object to furnish an improvement in covering harness mountings, which is inexpensive, and which at the same time will give a neat and elegant appearance to the mountings. It consists in covering mountings upon the outer side only with leather or hard rubber, leaving the inner side uncovered to receive the plating and the wear, thus avoiding facing the mountings with metal, and the attending trouble and expense. Wires are used in combination with the covering and mountings, covered by or imbedded in the said covering. A shoulder or recess is formed upon the outer surface of the mountings to adapt them to receive the cover upon their outer sides.

SAFETY WHIFFLETREES.—Albert H. McAllister, of Cotton Plant, Miss.—The object of this invention is to provide ready and convenient means for liberating a horse or horses from a carriage or other vehicle while the horse is in motion; and it consists in the construction of the trace hooks and in two liberating levers attached to the whiffletree, and in the construction, arrangement, and combination of parts, whereby if a cord be pulled, the bits of the trace hooks, which are held by concave ends of the tripping levers, will be forced off plates which hold them, and will liberate the traces from the whiffletree. Springs keep the levers in position, and securely confine the traces when everything is all right; but if anything breaks and the horse or horses become unruly, and danger is apprehended, all the driver has to do is to pull the cord and let the horse or team go.

FEED WATER HEATER.—William E. Walsh, of Jersey City, N. J.—This invention relates to a feed water heater for boilers, the arrangement of which is such that the holder may be constructed very cheaply by casting; but it may be constructed of sheet metal, if preferred. This invention has been made with special reference to the facility with which the holder can be molded and cast, so as to provide a cheaper heater, with larger heating surface in a small compass than can be made of wrought metal or of tubes; but it may be made of rolled sheet metal.

METALLIC PACKING FOR PISTON RODS, ETC.—David Devore, of Philadelphia, Pa., assignor to himself and Frederick A. Churchman, of Wilmington, Del.—This invention has for its object to furnish an improved metallic packing for piston rods, valve rods, pumps, etc., so constructed as to produce a secure and reliable packing, and one which will enable the wear to be conveniently taken up. It consists in the construction and combination of three lip and tongue jointed sections, with a stuffing box cap and shaft.

BOX FOR SEIDLITZ POWDERS.—Charles A. Browne and Isaac S. Browne of North Adams, Mass.—The object of this invention is to provide a box for seidlitz powders and other effervescing powders composed of different ingredients, wherein the acid and the soda or other ingredients may be kept separate and each in its proper quantity; and it consists in a box—made of wood or other material—with compartments, each of which is of suitable size or capacity to contain the exact proportion or quantity of the ingredients required. The advantages are that each compartment when filled contains the proper quantity, and much time is therefore saved in packing. The contents are more readily discharged and less likely to be spilled or wasted in using. The powders may, in the packages, be much more conveniently carried and handled, and are much more perfectly protected than they are at present.

WATER HEATER AND PURIFIER.—Perry Almy, of Williamson, assignor to himself and A. B. Williams of Sodus, New York.—The object of this invention is to provide efficient and convenient means for purifying water for use in steam boilers and for other purposes, having especial reference to what is known as "hard water," or water holding lime in solution. It consists in an apparatus in which the water to be purified is heated by means of steam to the boiling temperature, and then filtered through successive layers or beds of oyster shells, or similar material or substance, the apparatus being a tight vessel having a series of slatted partitions covered with shells, a steam chest, induction ports, exhaust pipe and water pipe, arranged in a peculiar manner and combined with the pipes proceeding from the exhaust pipe. By this apparatus the water is first heated and the carbonic acid expelled and then passed through heated shells, on which the lime is precipitated. The invention is based upon sound chemical principles, and will undoubtedly prove valuable in many localities.

GRADING AND DITCHING SCRAPER.—Charles D. Meigs and Montgomery C. Meigs, of Romney, Ind.—This invention has for its object to furnish an improved scraper for grading roads, opening ditches, etc., simple, inexpensive in manufacture, convenient and easily handled, and of very light draft. The rear part of the body of the scraper is curved upward to adapt it for receiving and holding the load. The body may be made of metal, or of wood faced or plated with metal. To the ends of the body are secured short axles, upon which are placed small wheels. To the body are attached two handles, the outer ends of which may be connected by a cross bar. The rear ends of the draft chains are secured to the ends of the body. The forward ends of the chain are attached to a ring, to which the draft is applied. The scraper may be made of any desired size, but for ordinary purposes a convenient size would be five feet long and two wide, the wheels being from eight to ten inches in diameter. With this construction, when the scraper has been loaded, by bearing down upon the handles, the entire weight of the load will be thrown upon the wheels, so that the loaded scraper can be conveniently drawn to any desired place, when, by releasing the handles, the scraper will turn over and thus unload itself. It is claimed this construction enables a single horse to do more work with greater ease than two horses can do with an ordinary scraper.

SEED PLANTER AND GUANO SPREADER.—Thomas Snow, of Social Circle Ga.—This invention consists in a novel combination of simple mechanical elements whereby not only seeds can be planted and fertilizers distributed, but by which seeds of different kinds, as corn and peas, may be discharged from two hoppers and planted in alternate hills.

TUCK MARKER FOR SEWING MACHINES.—George McFadden, of Worcester Mass.—This is a simple and useful invention, designed for attachment to the plates of sewing machines, to aid in the operation of "tucking," upon which three claims have been allowed in the letters patent. The device is well adapted to the purposes intended, as will be admitted on inspection by those acquainted with the tuckers now in use.

NAIL CUTTING MACHINE.—Thomas M. Laurence, of Piqua, Ohio.—This invention consists in the improvement of nail plate feeders, whereby the nail plate is turned and drawn back by a new combination of devices upon which three claims have been allowed. The machine appears a substantial and practical invention.

PROJECTILE FOR SMALL ARMS.—Carlos Madnell, of New Orleans, La.—This invention relates to an improvement in the class of missiles or projectiles for firearms in which the balls or bullets are formed in transverse or longitudinal sections. Hitherto these have been so constructed that when fitted together they were free to move one upon the other, and hence the slightest obstacle in flight of the ball may induce the sections to become separated, and thus frustrate the purpose of the missile. To remedy this defect, and provide a sectional ball capable of being rapidly, conveniently and even carelessly handled, without liability of the parts composing it becoming misplaced in the slightest degree, the inventor forms the sections with lateral angular projections and recesses, whereby they are adapted to fit together in a perfect manner.

APPARATUS FOR TRANSMITTING MOTION.—Peter Mehrhof, of Croton, N. Y., and Fernando Healy, of Barrington, R. I.—This invention consists in producing two revolutions of the crank shaft to one of the engine, by a connection of the engine to the walking beam by two rods connected together at one end, one of said rods being connected by its other end to an immovable body, and the other jointed at its other end to the walking beam, the connecting rod of the engine being jointed to the said rods, where they are jointed together in the manner of a toggle jointed connection. It is thought by the inventor that this mode of transmitting motion will be desirable for driving the paddle wheels of steam engines, and particularly so for driving propellers, being a cheap and simple substitute for the geared marine engines commonly used for driving them. In using it for driving propellers, the engine and walking beam can be placed in line with the propeller shaft by interposing a cross head and guides between the walking beam and connecting rod, and arranging the latter to vibrate perpendicularly to the beam. The apparatus may, of course, be used for driving machinery of al kinds, but is more particularly applicable for paddle wheels and propellers.

PIPE WRENCH.—Charles Neames, of New Orleans, La.—This invention has for its object to furnish an improved tool, so constructed as to adapt it for use as a gas pipe wrench, a gas pipe vise, and a square wrench for large bolts, effective in use in either capacity. The tool may be arranged for use as a vise for holding gas pipe while cutting screw threads upon it, and when thus used it can be adjusted for holding pipe of various sizes. By taking off a clevis or slotted bar and its attached screw, and removing two bolts the tool can be used as a gas pipe wrench for screwing and unscrewing gas pipe, and may be adjusted to various sized pipes. By shifting a bolt and pin, the tool becomes a good gas pipe wrench, and the harder it is pulled, the firmer it will grasp the pipe, bearing upon the four sides of the pipe equally, a vibrating fulcrum always throwing a toothed bar forward against the pipe to be grasped. By removing a bolt and thus detaching a lever, and placing pins in the holes of two bars, the tool becomes a very strong square wrench for large nuts and bolts.

SUPPORTING BUSK FOR CORSET FASTENING.—Melissa E. Bulkley, Providence, R. I.—This invention relates to a new device for conveniently attaching busks to corsets to support the fastening by which the two parts are united, and protect the body of the wearer from injury when a steel breaks. It consists in attaching two sliding plates and one stationary plate to the busk. Each of the former is made of a single piece of sheet metal, with its two ends bent over toward each other, and one of them bent back and transversely slotted. The stationary piece is constructed in the same form as the sliding pieces, except that the slot of the former is in the line of the length of the metal. This piece is passed over the steel of the busk and fastened thereon about midway, all being under the cover except the slotted and projecting end. The two sliding pieces are made to slide upon the cover of the busk, and there is sufficient friction to readily retain them wherever placed.

FOLDING BUREAU.—John E. Lawrence and John S. Young, Philadelphia Pa.—This invention consists of a bureau with a detachable top and back and the end pieces hinged to the front in such manner that the said ends and front may be bolted together and packed in a compact bundle when the drawers are taken out and the top and back removed. The back and top may be packed with the front and sides so as to economize space in storage and transportation. Thus, these articles of furniture—which formerly occupied much space, and were difficult to move about from room to room especially up and down stairs—may be readily taken apart and folded small packages, for storage and transportation.

WAGON WHEEL.—Christian Anderegg, Lawrenceburg, Ind.—Unlike mortises in ordinary wagon or carriage hubs, the inventor makes this hub mortise to receive a double tenon, the mortise consisting of an upper and a lower portion, the former receiving the real tenon of the spoke, and the latter the butt end of the spoke itself. These shoulders of the tenon are all sunk beneath the surface of the hub, and rest upon the bottom surfaces of the upper portion of the mortise. By this construction, it is claimed, the entire strength of the spoke is preserved. The shoulders of the tenon cannot act as fulcrums for the spokes to pry upon the tenon, which is the case where the shoulders of the tenon rest upon the surface of the hub. The mortises in the hub are arranged so that the spokes stand bracing to the center of the felly of the wheel. The tenon and the butt of the spoke are made to tightly fit the mortise, so that the whole strength and elasticity of the spoke is secured.

CHURN.—Miles Fisk, of Adrian, Mich.—This invention has for its object to furnish an improved churn, simple in construction, conveniently operated, and effective in operation, bringing the butter thoroughly and quickly. It consists in a novel construction and combination of various parts, which the inventor will explain, to parties interested, on application.

CORN PLANTER.—Joseph Pies, of Sparland, Ill.—This invention relates to a new corn planter, which is entirely self acting and double, and which prepares its own furrows, deposits the corn in proper succession, and covers it when in the ground. The invention consists in a very novel general arrangement of parts by which the object sought is effectually accomplished.

ROLLER SKATE.—John H. Fenton, of Indianapolis, Ind.—This invention relates to a new construction and arrangement of devices whereby wheels or rollers are attached to the foot support of a skate in such a manner as to enable the performer to execute all of the varied evolutions of skating on a smooth floor by the same or a similar motion of the body as employed in propelling the skater on ice. A saddle plate having a concave segmental bearing, pintle, socket, and wheel frame or hanger, slotted and provided with a convex segmental bearing, a pivot and a rubber cushion are the parts for which, together with their arrangement for the purpose described, a patent has been granted.

COTTON PRESS.—Thomas D. Simpson and William S. Lamkin, Marshal, Texas.—This invention relates to improvements in friction clamping apparatus used on vertical bars or rods of presses for holding the follower and lever in working the follower down upon the bale. The operation is similar to that of other presses of like character—that is, the upper block and dogs and the follower being raised as required for filling, the lower blocks are raised sufficiently to apply the levers, which, being raised at the free end to force the follower down and then lowered, the blocks will slide down by gravity for a new hold. But as it is inconvenient to work the levers at first when the follower is at or about the highest position, the inventor employs a long link with a hook in one end for connecting with the bottom of another link, and having the lever hooked into its lower end in a way that obviates the inconvenience. Curved blocks on the follower, combined with dogs pivoted in blocks that slide on the vertical bars, are the features upon which a patent has been obtained.

[OFFICIAL.]

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DESIGNS PATENTED.

5,472.—CARPET PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to John Gay, same place.
5,473.—TABLE.—William H. Groff, Lawrenceburg, Ind.
5,474.—BORDER FOR KNIT FABRICS.—Thomas Langham, Philadelphia, Pa., assignor to Thomas Dolan, same place.
5,475.—FIGURE FOR LAMP BASE.—David Mosman, West Meriden, Conn., assignor to Bradley & Hubbard, same place.
5,476.—FIGURE FOR LAMP BASE.—David Mosman, West Meriden, Conn., assignor to Bradley & Hubbard, same place.
5,477.—TYPE.—Richard Smith, Philadelphia, Pa., assignor to Mackellar, Smiths & Jordan, same place.
5,478.—ORNAMENTATION OF BUCKLES.—James O. West, New York city.

TRADE MARKS REGISTERED.

362.—PAINT.—Nathan L. Dearborn, Dover, N. H.
633.—PRESERVED FISH.—Israel C. Mayo, Gloucester, Mass.
634.—PREPARED PLASTERING PAPER.—The Rock River Paper Company, Beloit, Wis.
635.—HARROW.—J. J. Thomas & Co., Geneva, N. Y.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

19,347.—INDIA RUBBER DOOR MAT.—E. M. Chaffee. January 31, 1872.
19,490.—METAL BALE TIES.—F. Cook. February 14, 1872.
19,328.—CANE GUN.—J. F. Thomas. January 24, 1872.
19,200.—STRAW CUTTER.—J. H. Mumma. January 20, 1872.
19,465.—CARPET BEATER.—J. Harris, Jr., and D. Holmes. February 7, 1872
19,321.—PLOWS.—G. Watt. January 24, 1872.
19,696.—GRINDING ATTACHMENT.—D. H. Gage. March 6, 1872.
19,318.—LAP BELT JOINTS.—H. Underwood. January 24, 1872.
19,384.—CHECK CANCELER.—W. M. Simpson. January 31, 1872.
19,370.—KNITTING MACHINE.—J. K. and E. E. Kilbourn. January 31, 1872.
19,346.—CANAL BOAT.—H. Camp. January 31, 1872.
19,398.—HYDRAULIC VALVE.—C. and G. M. Woodward. January 31, 1872.
19,377.—HARVESTER.—F. Nishwitz. January 31, 1872.
19,349.—SHINGLE MACHINE.—G. Craine. January 31, 1872.
19,420.—HORSE RAKE.—W. Horning. February 7, 1872.
19,462.—STRAW CUTTER.—T. H. and D. T. Willson. February 7, 1872.
19,412.—SHOVEL PLOW.—P. Dennis. February 7, 1872.
19,417.—COTTON GIN.—B. D. Gullett, February 7, 1872.
19,461.—SHOE PEG MACHINE.—A. Woodward. February 7, 1872.
19,555.—RAIL SPLICE JOINTS.—M. Fisher. February 21, 1872.
19,979.—SEWING MACHINE.—C. F. Bosworth. April 4, 1872.
19,487.—CONTINUOUS METAL LATHING.—B. Cornell. February 14, 1872.
19,517.—METAL PAN MACHINE.—E. A. Smead. February 14, 1872.
19,483.—HARVESTER.—J. S. Butterfield. February 14, 1872.
19,572.—PACKING FLOUR.—J. Mattison. February 21, 1872.
19,610.—RAISING DOUGH.—J. Perry and E. Fitzgerald. February 21, 1872.
19,638.—FLOATING ANCHOR, ETC.—J. Humphries. February 28, 1872.
19,719.—LOOM STOP MOTION.—R. J. Stafford. February 6, 1872.
19,741.—RAILROAD CAR AXLE BOX.—R. N. Allen. February 6, 1872.
19,548.—SECURING KEY OF JOURNAL BOX.—L. Dederick. February 21, 1872.
19,619.—PLANING BLIND SLATS.—C. Carlisle and L. Worcester. Feb. 28, 1872.
20,235.—FLY NET.—R. Wilson. April 24, 1872.
20,238.—SASH FASTENER.—F. W. Brocksieper and J. B. Sargent. April 24, 1872.
19,594.—ENGINE VALVE.—I. Van Doren. February 21, 1872.
19,787.—WINDLASS.—J. P. Manton. March 13, 1872.
19,806.—ROTARY CUTTER.—J. A. Woodbury. March 13, 1872.
19,637.—GRAIN SEPARATOR, ETC.—S. Howes and G. E. Throop. Feb. 28, 1872.
19,654.—TRIMMING MACHINE.—A. C. Semple. February 28, 1872.
19,636.—PHOTOLITHOGRAPHY.—J. A. Cutting and L. H. Bradford. Feb. 28, 1872
19,693.—HOT AIR FURNACE.—J. Child. March 6, 1872.
19,747.—WIRE STAPLE.—B. Boardman. March 13, 1872.
19,819.—LIGHTNING CONDUCTOR.—O. White. March 13, 1872.
19,830.—WHEEL HUB.—J. M. Whitney. March 13, 1872.
19,644.—SAWING MACHINE.—H. H. Low. February 28, 1872.
19,718.—RAILROAD TURN TABLE.—W. Sellers. March 6, 1872.
20,073.—PROTECTING GILDING.—P. V. Mathews. April 10, 1872.
19,783.—LEAD PENCIL AND ERASER.—H. L. Lipman. March 13, 1872.
9,767.—TESTING CAR SPRING.—P. G. Gardiner. March 13, 1872.
19,770.—DOLL HEAD.—L. Greiner. March 13, 1872.
19,786.—LATHE CHUCK.—J. L. Mason. March 13, 1872.
20,192.—SEATING CUTTERS IN BITS.—W. A. Clark. April 24, 1872.
19,855.—ICE PITCHER.—E. Kaufmann, March 20, 1872.
19,834.—MEASURING SYRUP.—E. Bigelow. March 20, 1872.
19,206.—HYDRANT.—W. Race and S. R. C. Mathews. January 22, 1872.
20,353.—ELECTROTYPE PLATES.—S. P. Knight. May 8, 1872.
19,914.—TRUSS PAD.—W. F. Daily. March 27, 1872.
19,966.—WATCH CASE.—E. Bliss. March 27, 1872.

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HEAD DRESS, ETC.—L. E. Love, New York city.
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PRODUCING COLD, ETC.—A. C. Twining, New Haven, Conn.
REEFING SAILS.—J. E. Worthman, Mobile, Ala.
ROLLING BARS, ETC.—H. Kellogg, Milford, Conn.
SEATS FOR VEHICLES.—J. & L. Jenkins, State of Maryland.
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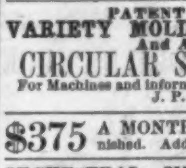

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